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LINGUISTICS.—*Six common Navajo nouns accounted for.*[1] JOHN P. HARRINGTON, Bureau of American Ethnology.

The Navajo Indians are North America's largest tribe and occupy the biggest Indian reservation in the United States, which is situated in the States of Arizona and New Mexico. A half dozen of some of the very most widely known words of the Navajo language, each with a new derivation or connection, are here presented.

The Navajo word for bean of any kind, *Phaseolus vulgaris* L. and other spp., is nàa'òłí. To one conversant with the far-swung forms of Spanish frijoles, beans, singular frijol, bean, in several Indian languages, the source of this Navajo word as Spanish frijoles seems likely. If we accept this postulation, another word for bean must have obtained in Navajo in pre-Spanish times. The name of bean in all the languages surrounding the Navajo has been looked into.

The common Navajo term for blanket is pèeltléí, sometimes pronounced péeltlátí. This term not only is used by the Navajo for blanket but is the common term for the famous Navajo blanket, which in English is sometimes called a blanket and sometimes a rug, and for the making of which the Navajo Indian tribe is known all over the world. This word is nothing short of Spanish fresada, blanket, which is the ordinary Spanish word for blanket, in corrupted form, pèeltlátí even retaining the three syllables of the Spanish. This brings out the interesting fact that not only is the Navajo blanket largely due to Spanish acculturation but also that its name is derivative to Spanish.

The Navajo call a white man Pìlìkáanà. This is from Spanish Americano, American, with a twist in meaning. United States American is mostly meant, a Mexican being termed apart. Several other terms for United States American based on soldier dubbings are still more or less in use, while calling United States American by the word meaning enemy, as is done in several Apache languages, is not the practice in the Navajo language of today and may never have been.

The center of Navajo craftsmanship is the blanket; the supply for this center is tìpé, sheep. Codescendant languages show clearly that this is in origin the name of the wild sheep now extended in meaning to apply to the tame one. The original meaning was clearly the bleater.

Navajo kàt, juniper, *Juniperus monosperma* (Engelm.) Sarg., is also a very common word as regards its designation. All the Navajo country of lower levels is dotted with kàt, juniper trees, and occasionally one sees a juniper tree which has been struck by lightning. This Navajo word is patently the same as the neighboring Laguna Keresan k'á'nì, juniper. Since the Navajo are well known to have come from the north, the transmission of the name may well have been in the direction from the Laguneño to the Navajo. One should distinguish Navajo k'àt, now, also of grave intonation, which has the same start as the Laguna Keresan word. In Navajo kà'nìJìi, white spruce, literally pull-out juniper (referring to the needles being easy to pull out), an earlier *katnijii has had its *t* smothered, turned into alif.

Navajo xòoGàn refers to the native-style house, hogan, while khìn means a rectangular house. Sometimes one hears what might be written x^{w}òoGàn. The word xòoGàn means in etymology a dwelling-place, being composed of xòo-, referring to area, and -Gàn, a stereotyped verb meaning to dwell. Chiricahua khòoGą, native house, is absolutely the same word with the same meaning as the Navajo has.

[1] Received September 21, 1945.

BOTANY.—Kokonoria, *a new genus of Plantaginaceae from Tsinghai Province, China.*[1]

YI-LI KENG and KWAN-HOU KENG, National Central University, Chungking, China. (Communicated by EGBERT H. WALKER.)

In the summer of 1944 the authors had an opportunity to undertake an expedition to the northwestern part of China. They went to Lake Kokonor in Tsinghai Province and to Labrang in Kansu Province with a view to investigating the grazing lands and the forage plants of these regions for the National Research Bureau of Animal Industry, China. During this survey they collected nearly a thousand numbers of botanical specimens, which are now deposited in the herbarium of the National Central University. Naturally there were many novelties found in these two botanically very little known regions. One of these specimens represents a new genus of Plantaginaceae, described herewith. Although the study of the whole collection is far from complete, it seems desirable to publish this new genus at the present time.

The authors wish to express here their gratitude to Dr. Vougi Tsai and Prof. Tieh-tsai Chang, the director and vice-director, respectively, of the Bureau, through whose zealous recommendation, kind assistance, and financial maintenance the authors were able to conduct the expedition successfully.

Kokonoria[2] Keng & Keng f., gen. nov.

Flores hermaphroditi, zygomorphi, trimeres, receptaculo brevissime cupulari, juventate tenuiusculo; calyx gamosepalus, persistens, bilobatus, lobis membranaceis, lateraliter positis, saepissime antice vix conjunctis; corolla sympetala, ad maturitatum subcoriacea sed decidua, breviter trilobata, lobis deorsum imbricatus, duobus anticis minoribus, tubo quam limbo multo longiore, interdum ad fauces constricto, arcte ad marginem receptaculi cupularis affixo; stamina 2 (tertium anticum absens), inclusa vel vix exposita, ad vel infra incisiones duas laterales inter corollae lobis inserta; antherae ad maturitatem inversum V-formae, subsessiles vel a filamentis brevissimis fultae, thecis duabus divergentibus, longitudinaliter dehiscentibus, distinctis vel apice confluentibus; pollen ellipsoideum, longitudinaliter 3-sulcatum; discus perigynus, annularis sed serius utrimque lobis duobus elevatis accrescentibus appendiculatus; ovarium liberum, breviter stipitatum, biloculare, loculis 1-ovulatis; stylus unicus, terminalis, dimorphus, aut brevis inclususque aut longior exsertusque, stigmate terminali, paulum bilobulato; ovula linearis, anatropa, ex apice loculi ovarii pendula; fructus drupaceus, bracteа atque lobis duobus calycis subtentus, biseminalis, mesocarpio textura spongiusculo; semina dorsaliter compressa, anguste oblongi-lanceolata, exalbuminosa, in sectione semicircularia, testa tenui, laevi; embryo rectus, radicula brevissima, superiore, cotyledonibus oblongis, subcarnosis. Herbae perennes, humiles, stoloniferae; rhizomata crassa, foliorum basibus emarcidis fibrillosis vestita; folia radicalia, alternata, simplicia, integra, inferne attenuata sed basi in structuras membranaceas vaginis similes dilatata; flores parvi, bracteati, desiccatione nigri, in scapis axillaribus quam foliis brevioribus spicati, bracteis magnis, in anthesi praeter eas margines liberas lateri antico receptaculi cupularis inferne plus minusve adnatis. Species unica, provinciam Tsinghaii, prope mare conclusum Kokonoris habitans.

Flowers hermaphrodite (always so?), zygomorphic, trimerous, the receptacle shortly cupular, rather thin in texture when young (as also the calyx); calyx gamosepalous but usually much less united in front, persistent, laterally 2-lobed, the anterior lobe entirely wanting but replaced in the corresponding position by a large bract adnate below to the cupular receptacle but with free margins; corolla sympetalous, thickened in anthesis but deciduous in fruit, shortly 3-lobed, the posterior lobe larger, descending-imbricate, the tube much longer than the limb, firmly attached to the margin of the receptacle, sometimes constricted at the throat; stamens 2 (the anterior stamen wanting), included or scarcely exposed, inserted at or just below the two lateral notches between the corolla lobes; anthers inverted V-shaped at maturity, subsessile or with short filaments,

[1] Received October 26, 1945.

[2] From "Kokonor," which means in Mongolian the "blue sea."

the two cells divergent, dehiscing lengthwise, distinct or confluent at apex; pollen grains ellipsoidal, longitudinally 3-furrowed; disk perigynous (its attachment seen in a young flower a little below that of the corolla tube), annular but later appendaged on both sides with two prominent elevated lobes; ovary superior, shortly stipitate, bilocular, each locule 1-ovuled; style 1, terminal, dimorphic (either short and included or slender and exserted) with a terminal slightly 2-lobed stigma; ovule linear, anatropous, pendulous from the apex of the ovary cell; fruit drupaceous, subtended by a bract and two calyx lobes, 2-seeded, the mesocarp somewhat spongy in texture; seeds dorsally compressed, narrowly oblong, exalbuminous, semicircular in section; testa thin, smooth; embryo straight, with a short superior radicle and two somewhat fleshy cotyledons. Perennial stoloniferous low herbs with simple stout rhizomes, which are covered with emarcid fibrillose leaf bases; leaves radical, alternate, simple, entire, attenuate below but broadened at base into membranous sheathlike structures; flowers small, bracteate, spicate on axillary scapes shorter than the leaves. One species endemic near Lake Kokonor, Tsinghai Province, China.

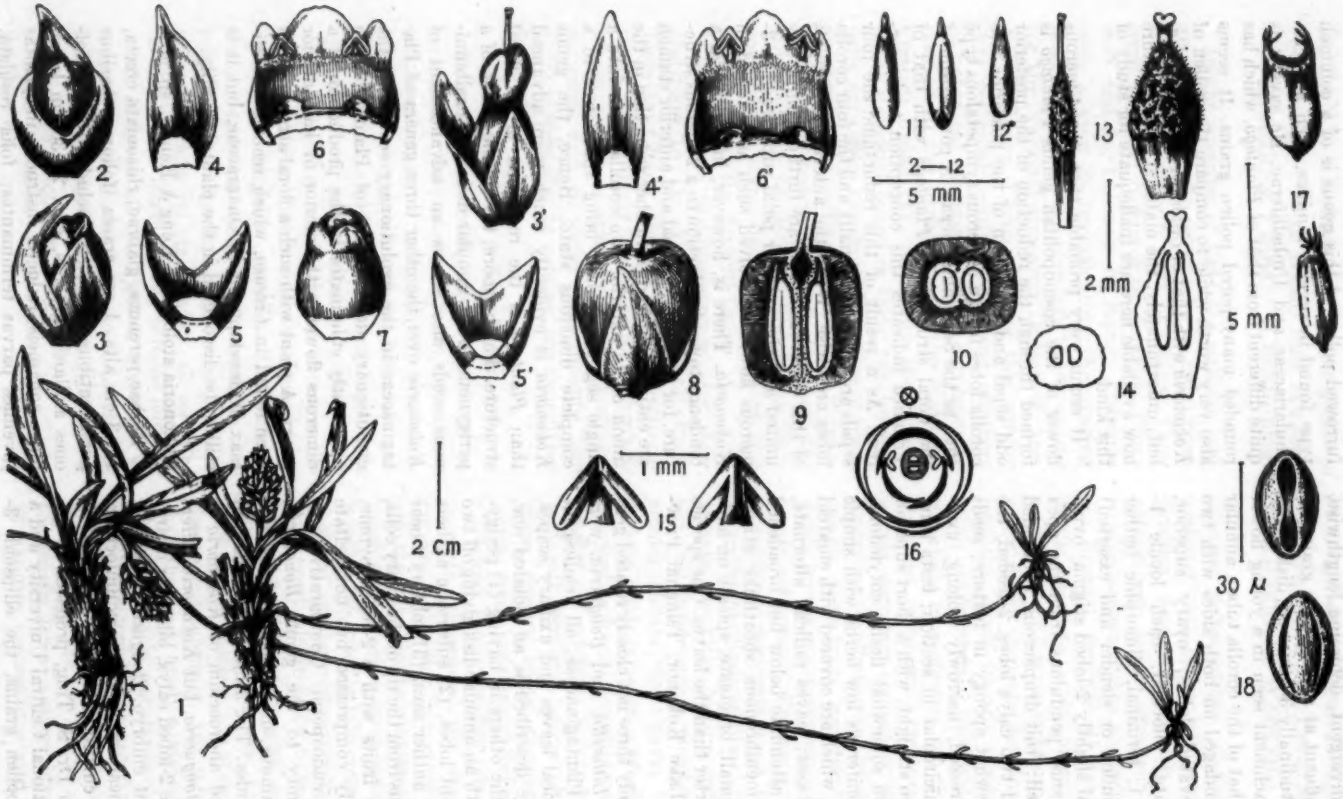
Heretofore only three not closely related genera, *Plantago*, *Littorella*, and *Bougueria*, were known in the Plantaginaceae, all acaulescent herbs with radical leaves and axillary scapes. The genus here described is an isolated one, differing from the others in having (1) perigynous flowers with an annular disk giving off two lateral accrescent lobes, (2) subsessile anthers with divergent anther sacs, (3) solitary linear ovules pendulous from the tip of the ovary cells, (4) drupaceous fruits with a 2-celled pyrene, and (5) dorsally compressed but not peltate seeds without endosperm. Comparatively it shows an affinity to the genus *Bougueria*, which is polygamous, monotypic, and endemic on the high Andes. The 3-merous corolla and the 2-membered androecium of *Kokonoria* is also found in *Bougueria*, but *Kokonoria* differs from that in the 2-lobed calyx, bilocular ovary, and the straight embryo, *Bougueria* having a calyx of four linear sepals, an ovary unilocular, and an embryo curved around the albumen.

According to Dr. S. Ting, professor of geography at National Central University and a specialist on pollen grains, the ellipsoid, 3-furrowed pollen of this genus is of a common type found in several families, such as Scrophulariaceae and Umbelliferae. He says it is quite different from that of *Plantago*, which has rounded many-pored pollen grains. It seems also very worth while to compare the pollen of *Kokonoria* with that of *Littorella* and *Bougueria*, but, unfortunately, the material and literature now available here are inadequate for study of this kind.

It seems very probable that the 4-merous flower of the cosmopolitan genus *Plantago* is formed through the reduction of the posterior odd sepal and the union of the posterior two corolla lobes from a 5-merous sympetalous type such as the Scrophulariaceae. A comparison of the floral structure of *Plantago* with that of *Veronica* indicates this conception to be correct. As a result of this reduction, the four sepals are placed diagonally and the four corolla lobes crosswise. When the anterior two sepals of this 4-merous flower are further completely united and the anterior petal suppressed, a 3-merous flower is evolved such as is found in *Kokonoria*. There is, however, in *Kokonoria* a tendency toward reduction to a 2-merous structure, for the anterior sepal and anterior stamen are entirely reduced. A further reduction in the union of its anterior two corolla lobes into a single segment would bring the flower to a complete dimerous state. Hence, the genus *Kokonoria* is evidently much more advanced than *Plantago* is the reduction of its floral structure. Furthermore, the development of a perigynous flower, annular disk, and exalbuminous seeds also shows an advancement of *Kokonoria* over the other three genera of Plataginaceae in the evolutionary scale. But the evolutionary development of Plantaginaceae apparently culminates in the production of a dimerous flower with inferior or half-inferior ovary. A plant with such a floral structure has been found in *Circaea*, which reaches the climax of development in Onagraceae, but it is still to be discovered in the plantain family.

Kokonoria stolonifera Keng & Keng f., sp. nov.

Herbae perennes, glabrae; rhizomata erecta, 1.5–3 cm alta, 1 cm crassa (foliorum basibus persistentibus fibrillosis includentibus); stolones axillares, graciles, circ. 20–30 cm longi, foliis squameis reductis instructi, in plantas juveniles parvas terminantes; folia rosulata,



FIGS. 1–18.—*Kokonoria stolonifera* Keng & Keng f., drawn from type: 1, habit; 2, posterior view of a plumper flower; 3, lateral view of same; 3′, lateral view of a thinner flower; 4, 4′, interior views of bracts, lower unshaded part showing degree of adherence to cupular receptacle and calyx tube; 5, 5′, calyces with cupular receptacle below dotted circle; 6, 6′, interior views of expanded corollas showing stamens and annular disk with its appendages, part below dotted line belonging to cupular receptacle; 7, plumper flower with bract and calyx removed, showing corolla inserted on cupular receptacle as a whole; 8, fruit with persistent bract, calyx, and style-remnant; 9, 10, longitudinal and cross section of fruit; 11, posterior and anterior views of seed; 12, embryo showing short superior radicle and two cotyledons; 13, two pistils, the one slender from a thinner flower, the other stout from plumper flower; 14, cross and longitudinal section of pistil; 15, anterior and posterior views of stamen; 16, floral diagram; 17, side (above) and face (below) views of a stone; 18, two views of a pollen grain. 4, 5, and 6 are drawn from plumper flowers; 4′, 5′, and 6′ are from thinner flowers.

obscure viridula, plus minusve carnosa, anguste lanceolata, 15–55 mm longa, 5–6 mm lata, inferne attenuata et petiolis similia, costa media infra prominenti, supra depressa; pedunculi compressiusculi, circ. 1.5 cm longi, 1 mm lati sed sursum versus apicem paulum dilatati; spicae pauci- vel pluri-florae, 1–2 cm longae, circ. 1 cm crassae, erectae vel ad maturitatem pendulae; bractea straminea, membranacea sed dorso firmula, oblongi-lanceolata, 7–8 mm longa, 2–3 mm lata, integra, acutiuscula vel obtusa; flores subsessiles, conferti vel inferiores remoti; calycis tubus saepissime altitudine inaequalis, in latere antico circ. 1.5 mm altus et in postico 2.5 mm, lobis ovatis, in anthesi late patentibus, 3–3.5 mm longis, 3 mm latis, margine late scariosis sed costa media viridulis, prope apicem crispe ciliolatis; corolla juvenilis membranacea albidaque, aetate subcoriacea puniceaque, tubo circ. 5 mm longo, 3 mm in diametro, extus glabro sed intus ad fauces puberulenti, desiccatione nigro, irregulariter rugoso, posteriore plus minusve inflato, lobis erectis, obtusis, ovatis vel subrotundis, colore quam tubo siccano clarioribus, uno postico quam duobus anticis longiore sed multo latiore, interdum emarginato, 1–1.5 mm longo, 1.5 mm lato; disci lobi oblongi, cuneati, vel quadrangulares, 1.5–3 mm longi, 1–2 mm lati, ad maturitatem subcoriacei, irregulariter divisi vel erosi, fusci-brunnei, super ovarii stipitem incumbentes; staminis filamentum brevissimum, usque ad 1 mm longum; antherae flavidi-brunneae, thecis circ. 1 mm longis; pollen 30–40μ longum, 13–23μ latum, sulcis 3 profundis longitudinalibus pervagatum, tenuissime sed irregulariter granulare; ovarium juvenile lateraliter compressum, ellipticum glabrumque, serius lineari-oblongum vel fusiforme, circ. 3.5 mm longum (stipite glabro includente), 1–2 mm crassum, superne puberulum et irregulariter rugosum; stylus sive crassus circ. 0.5 mm sive gracilis usque ad 5 mm longus, stigmate capitulato, laevi, minute bilobulato; fructus globularis, 5–7 mm longus, 3–5 mm in diametro, glaber, fusci-brunneus, stylo vel eius residuo persistente superatus, pericarpio siccano, circ. 1.5 mm crasso, pyrena lignosa, nigrescente, tereti sed leviter lateraliter compressa, 4–5 mm longa, 2 mm lata (in latere latiore), basi breviter constricta, apice crescente (in aspectu laterali), in margine antero-posteriore fibris erectis lignosis fimbriata; semen albidem, 4 mm longum, 1 mm latum, extrinsecus canaliculo tenui longitudinali medio sulcatum; embryo semine paulum brevior, cotyledonibus plano-convexis, ultra 3 mm longis.

Perennial glabrous herbs; rhizomes upright, 1.5–3 cm tall, about 1 cm thick including the straw-colored fibrillose leaf bases; stolons slender with scalelike leaves, about 20–30 cm long, terminating in small plantlets; leaves several in a rosette, dark green, more or less fleshy, narrowly lanceolate, 1.5–5.5 cm long, 0.5–0.6 cm wide, acute, attenuate and petiolelike below, the midrib prominent beneath, depressed above; peduncle 2-edged, about 1.5 cm long, 1 mm wide but somewhat broadened toward the apex; spikes several- to many-flowered, 1–2 cm long, about 1 cm. thick, erect or pendulous at maturity; bract stramineous, membranous but somewhat firm dorsally, oblong-lanceolate, 7–8 mm long, 2–3 mm wide, entire, acutish or obtuse; flowers subsessile, crowded or the lower ones somewhat remote; calyx tube (including the cuplike receptacle) usually asymmetric, about 1.5 mm on the anterior and 2.5 mm long on the posterior side, the lobes ovate, wide open in anthesis, 3–3.5 mm long, 3 mm wide, broadly scarious with prominent green midribs, crinkled-ciliolate near the apex; corolla membranous and whitish when young, subcoriaceous and pinkish when mature, the tube about 5 mm long, 3 mm across, glabrous outside, puberulent at the throat within, irregularly wrinkled when dry, dorsally more or less inflated, the lobes erect, obtuse, ovate or somewhat rounded, lighter in color than the tube (seen in dry specimens), the anterior two slightly shorter but much narrower than the posterior one, which is sometimes emarginate, 1–1.5 mm long, 1.5 mm wide; disk lobes oblong, cuneate or quadrangular, 1.5–3 mm long, 1–2 mm wide, irregularly cleft, subcoriaceous at maturity, dark brown, pressed against the stipe of the ovary; filaments from very short to 1 mm long; anthers yellowish brown, with sacs about 1 mm long; pollen 30–40μ long, 13–23μ wide, longitudinally traversed with three deep furrows, the exine finely but irregularly granular; ovary laterally compressed, elliptic and glabrous when young, later becoming linear-oblong to fusiform, about 3.5 mm long (including the glabrous stipe), 1–2 mm thick, puberulent and irregularly wrinkled; style either stout, about 0.5 mm long, or slender

stout, from plumper flower; 14, cross and longitudinal section of pistil; 15, anterior and posterior views of stamen; 16, floral diagram; 17, side (above) and face (below) views of a stone; 18, two views of a pollen grain. 4, 5, and 6 are drawn from plumper flowers; 4', 5', and 6' are from thinner flowers.

and up to 5 mm long; stigma capitulate, smooth, bilobed; fruit globular, 5–7 mm long, 3–5 mm across, glabrous, dark brown, surmounted by the persistent style or its remnant, the pericarp dry, about 1.5 mm thick; stone (pyrene) woody, nigrescent, terete but somewhat compressed laterally, 4–5 mm long, 2 mm wide (the broader side), shortly constricted at base, crescent at apex (in side view) with erect wood fibers on the anterior-posterior margins; seed whitish, 4 mm long, 1 mm wide, outwardly sulcate with a fine longitudinal median groove; embryo slightly shorter than the seed, with planoconvex cotyledons over 3 mm long.

Type in the Herbarium of the Department of Biology, National Central University, Chungking, China, collected on the exposed bare ground of the steppe, near the ruined city Ch'a-han-chêng, (察汗城), about 30 miles east of Lake Kokonor, Huan-yüan-hsien (湟源縣), formerly known as Tan-kê-erh (丹噶爾), Tsinghai Province, August 10, 1944, by Y. L. Keng and son (no. 5286).

There are two kinds of flowers (see Figs. 3 and 3′) in this species, one near the base of the spike having plumper corollas, subsessile anthers, and short included styles, the other on the upper part with rather slender corollas constricted at the throat, very short but distinct stamen filaments, and longer exserted styles. Though each flower form possesses two well-developed stamens and a pistil, all the fruits seen are found to have a rather long style or its remnant at the apex. Therefore, further examination is needed to decide whether the flower with a short included style is fertile. It is quite certain, however, that the flowers are all entomophilous, since the anthers never exceed the erect corolla-lobes which would be necessary for wind pollination. The zygomorphy of the flower is shown not only by the corolla with three unequal lobes but also by the calyx, which usually has an unequal union of the two laterally placed sepals.

The bract of a rather young flower is dorsally more or less adherent below to the anterior side of the very short cupular receptacle including the calyx tube. But the short calyx tube is sometimes also found to be distinctly exposed in front beyond the adnate portion of the bract. No matter how much the adherence of the bract, the margins are always quite free from either the receptacle or the calyx. If there were no such free margins present, the bract would be easily mistaken in morphology for an anterior lobe of the calyx, which, like the anterior stamen, is entirely suppressed in this species. The corolla is at first distinctly perigynous and very thin in texture but becomes much thicker or even coriaceous at maturity and appears to have increased its size and thickness downward so much that it seems thenceforth to be hypogynous. The deciduousness of the corolla is perhaps caused by the protrusion of the enlarged fruit, which ruptures the corolla and causes it eventually to fall off. Another peculiarity is that the annular disk, which is also perigynous with an attachment a little below the corolla, gives off on both sides two large thick and variously shaped appendages during its development from youth to maturity.

ENTOMOLOGY.—*Synoptic revision of the United States scarab beetles of the subfamily Dynastinae, No. 1: Tribe Cyclocephalini.*[1] LAWRENCE W. SAYLOR, Research Associate, California Academy of Sciences.

The important subfamily Dynastinae has for some time been relatively neglected, taxonomically speaking, and only in the past few years have new species been described or the larval characters of many species better characterized. In all collections I have seen, numerous United States species are grossly misidentified, and it is hoped that the present papers will help to rectify this condition.

Ritcher's paper (1944) is an excellent contribution to the immature stages of these insects. His title, however, *Dynastinae of the United States*, is very misleading, because this paper includes only a small proportion of the described United States species, and only those adults are mentioned of which he had larvae; thus, of the 18 described genera and 119 United States species listed as valid in Arrow's latest catalogue (1937), Ritcher treats the larvae and adults of but 12 genera and 20 species. Even though a

[1] Received August 13, 1945.

number of these 119 names are not valid, many of them are important and well-known species and must be considered. Also, two generic and three specific names that Ritcher uses have been changed; regardless of these taxonomic errors, the paper is very important from an economic standpoint.

Casey's studies in this group have greatly enlarged our synonymy because of his practice of naming trifling variants, but at the same time his Memoirs (1915) gave more detailed information and pointed out more new characters and relationships than had any of his predecessors or contemporaries, including Horn and LeConte; it is indeed too bad that Colonel Casey's idea of a "species" was not exactly that of the vast majority of coleopterists; otherwise his work in this family would have stood for some time. I have had the privilege of studying and dissecting all of Casey's scarab types through the courtesy of Dr. A. Wetmore and Dr. E. A. Chapin, of the U. S. National Museum, to both of whom I am indebted for many favors in the past.

The Dynastinae in most instances possess well-chitinized genitalia, and the characters of those of the male are very helpful in specific determination, and wider use should be made of them. Indeed, in such difficult genera as *Cyclocephala*, it is necessary to dissect and compare the male genitalia in order properly to place many of the troublesome variants.

Dynastine bibliography is now so long and detailed in most genera that very little is to be gained by citing every unimportant reference, as this has already been done in Arrow's catalogue of world Dynastinae. Thus, in the present series of papers, of which this is the first of four, only the important bibliographical references have been selected and a list of those cited is given at the end of each paper. Keys to all tribes and genera will be given in the last paper of the series.

KEY TO THE GENERA

1. Ligula strongly convex, apex very deeply incised and declivous; clypeus long and parabolic, without front angles, and very obtusely angulate at midapex; mandibles very long and slender and exposed beyond clypeal apex; male front claw enlarged.
Ancognatha Erichson

Ligula variable, but never more than slightly emarginate, never incised; clypeus of different shape; claws variable.....2

2. Color black, mandibles broad, rounded externally and either exposed beyond or hidden beneath clypeus; clypeus *either* trapezoidal and short with apex not reflexed *or* clypeus longer and strongly reflexed, with clypeal suture entirely obsolete and front coarsely cribrate and convex.....3

Color testaceous, often mottled with brown cloudings (only *very* rarely blackish); clypeal suture always strongly indicated; mandibles extended beyond clypeal apex and very slender.....4

3. Clypeus very strongly reflexed apically and faintly emarginate; clypeal suture entirely lacking; base of ligula very deeply and triangularly emarginate, apex very narrow; all claws both sexes simple; first segment of hind tarsus longer than next two combined; Arizona.....*Coscinocephalus* Prell

Clypeus faintly emarginate apically and not reflexed; clypeal suture strong; ligula flattened at base, apex very broad; front claws of male enlarged; first segment of hind tarsus a little longer than second.
Dyscinetus Harold

4. Head very broad, nearly three-fourths width of thorax, clypeus very long and flat, sides parallel and apex subrounded; Central America and ?Texas.....*Aspidolea* Bates

Head definitely less than half as wide as thorax; clypeus variable but never exactly as above (if long, no longer than front).
Cyclocephala Latreille

Genus **Ancognatha** Erichson

Ancognatha Erichson, 1847, p. 97; Lacordaire, 1856, p. 398; Bates, 1888, p. 297; Casey, 1915, p. 124.

Only a single species occurs in the United States, but it is quite variable in color, especially the Mexican examples.

Ancognatha manca LeConte

A. manca LeConte, 1866, p. 382; Bates, 1888, p. 335; Arrow, 1911, p. 169; Casey, 1915, p. 127.
A. aequata Bates, 1888, p. 297, pl. 17, fig. 12.
A. perspicua Casey, 1915, p. 126.
A. suniella Casey, 1915, p. 127.
A. durangoana Casey, 1915, p. 125. (New syn.)
A. laevigata Bates, 1888, p. 297. (New synonymy.)

I have examined specimens from central Mexico to Arizona and New Mexico. Varies in color from deepest black, to black with rufo-castaneous elytra and legs, to castaneopiceous with testaceous legs, scutellum, and thoracic margins; most Arizona specimens are the last phase. The length varies from 15 to 19 mm. The very tumid, deeply cleft ligula will readily place the species.

Genus **Coscinocephalus** Prell

Coscinocephalus Prell, 1936, p. 145.
Anoplocephalus Schaeffer, 1906, p. 259. (Preocc.)

Our single species from Arizona is the sole representative of this genus.

Coscinocephalus cribrifons (Schaeffer)

Anoplocephalus cribrifons Schaeffer, 1906, p. 260; Casey, 1915, p. 124.

The maxilla of this uncommon species is entirely unarmed (no teeth), and the mentum (ligula) is very strongly acuminate apically as in *Cyclocephala hirta*, but differs in the base in *Coscinocephalus* being deeply and triangularly depressed at base. The long and coarsely cribrate clypeus, which is strongly reflexed and faintly emarginate apically, also distinguishes the genus.

Genus **Dyscinetus** Harold

Dyscinetus Harold, 1869, p. 123; Casey, 1915, p. 165; Prell, 1936, p. 147.
Chalepus Macleay, 1819, p. 149; Lacordaire, 1856, p. 403.
Palechus Casey, 1915, p. 174.

Arrow lists 20 species of this purely American genus, which ranges throughout the Americas and the West Indies, and many of them are of considerable economic importance.

KEY TO THE SPECIES

Pygidium entirely and coarsely cribrate; clypeus finely punctured and smooth; eastern United States, west to Texas.... *morator* (Fabricius)
Pygidium coarsely to somewhat coarsely but not densely punctured; spaces between punctures highly polished and smooth; clypeus coarsely and transversely rugose; California and east to New Mexico and south to Mexico and West Indies..... *picipes* (Burmeister)

Dyscinetus morator (Fabricius)

Scarabaeus morator Fabricius, 1799, p. 24; Arrow, 1937, p. 17. (*Dyscinetus.*)
Dyscinetus trachypygus Burmeister, 1847, p. 79; Bates, 1888, p. 312; Casey, 1915, p. 171; Ritcher, 1944, p. 21 (larva).
Dyscinetus discedens Casey, 1915, p. 171.
Dyscinetus borealis Casey, 1915, p. 171.

This is the common rice beetle which ranges through the mid-eastern States and southern States west to Texas and Kansas. The larvae feed beneath the sod and occur also in compost heaps or near pigpens (Phillips and Fox).

Dyscinetus picipes (Burmeister)

Chalepus picipes Burmeister, 1847, p. 79.
Chalepus obsoletus LeConte, 1854, p. 222. (New synonymy.)
Chalepus geminatus Jacquelin du Val, 1856, p. 127.
Dyscinetus ebeninus Casey, 1915, p. 169.
D. subquadratus Casey, 1915, p. 166.
D. gilianus Casey, 1915, p. 168.
D. laevissimus Casey, 1915, p. 167.
D. puncticauda Casey, 1909, p. 282; Casey, 1915, p. 169. (New synonymy.)
D. punctipes Bates, 1888, p. 312.

Specimens have been examined from California, Colorado, Arizona, New Mexico, and Kansas, as well as from Mexico and the West Indies (Puerto Rico, Cuba, Guadeloupe, and Dominican Republic). The pygidial puncturation is highly variable and is usually coarser and sparser in the male, with the female often rather finely and sparsely punctured. In some New Mexican males the pygidium is very cribrately and contiguously punctured at the sides, as is similar in some Mexican males where the pygidium is entirely, coarsely, cribrately, and contiguously punctate over the entire disc; the male genitalia and all other specific characters are identical, thus showing how unreliable the pygidial puncturation (on which many species have been based in the past) really is. The pygidial disc is usually glabrous with long hairs along the apical margin.

Genus **Cyclocephala** Latreille

Cyclocephala Latreille, 1829, p. 552; Lacordaire, 1856, p. 398; Bates, 1888, p. 299; Casey, 1915, p. 112, 134; Arrow, 1937, p. 7 (lists additional subgenera).
Spilosota Casey, 1915, p. 112.
Ochrosidia Casey, 1915, p. 112.
Dichromina Casey, 1915, p. 112.

This truly American genus contains over 200 described species, as well as many undescribed forms. The species are very difficult to separate by means of the older descriptions, and even present-day descriptions must be very long and exceptionally detailed properly to place the species. Many species feed on pollen in the flowers of Arums and become imbedded in the viscous pollen at the bottoms of the spathes; so far as I know, *C. dimidiata* Burmeister is our only species possessing this habit, and it occurs commonly in the flowers of the jimsonweed (*Datura*) in California (Van Dyke and Saylor). One Central American species (*prolongata*

Arrow) has the head and thorax very long and exceptionally narrowed anteriorly, apparently an adaptation for feeding in the blossoms of a narrow flower.

Our American (United States) species have been worked over by Casey in great detail, who described many variants, so that we have 39 names for what I consider to be only 10 valid species. In this study I have examined nearly 3,000 specimens in many collections during the past eight years.

The male tarsi are always enlarged in this genus and the female claws are small and simple. The male genital characters are good, if carefully studied and compared.

KEY TO THE MALES

(Check male genitalia in doubtful specimens)

1. Front tibia *unidentate* (smooth behind apical tooth); dorsally with fine sparse hairs; clypeus parabolic and angles not indicated; Arkansas.....*knobelae* (Brown)
   Front tibia always bidentate or tridentate *or* if apparently unidentate then the head black and clypeus narrow and nearly impunctate apically.....2
2. Front tibia peculiarly *bisinuate* externally (Fig. 1, *n*); head black; clypeus very narrow and rather long, apical half *smooth* and impunctate, apex strongly reflexed and subrounded, angles narrowly rounded; apparently glabrous above; thorax with two large piceous spots before midapex and a small piceous spot each side of disc; Alabama, Mississippi, and Georgia..*setidiosa* LeConte
   Front tibia bidentate or tridentate; other characters not as above.....3
3. Clypeus trapezoidal, apex subrounded and reflexed, angles very broadly rounded; disc *very smooth* and very sparsely and exceedingly finely punctured, to nearly impunctate; thorax and elytra with sparse erect hair, that of pygidium much longer; upper tooth of front tibia obsolete; Georgia, Alabama, Florida.....*puberula* LeConte
   Clypeus variable but always strongly sculptured.....4
4. Large claw front tarsus very strongly and widely cleft and upper tooth nearly as wide as apical one but much shorter in most cases (Fig. 1, *l*); tarsi subequal to or shorter than tibia; head black and elytra testaceous, otherwise rufous; antennal club *ovate*, only as long as segments 3–7 of stem; Mississippi west to California, south to South America.
   dimidiata Burmeister
   Large claw always much more narrowly cleft or claw entire.....5
5. Clypeus very strongly narrowed apically, apex narrowly reflexed; clypeal suture very strongly bisinuate, entire disc very grossly scabrose and entirely punctured; antennal club shorter than stem; fresh specimens with moderate to dense dorsal hairs; ligula strongly narrowed apically and apex pointed (Fig. 1, *w*); California to Texas.
   hirta LeConte
   Clypeus not as above; ligula variable but never actually pointed apically.....6
6. Clypeus fairly long, sides often nearly straight behind and only faintly convergent apically, apex subtruncate and very strongly and highly reflexed; disc very coarsely and transversely, rugosely wrinkled; antennal club large and longer than the stem; California, Lower California, and Arizona.
   longula LeConte
   Clypeus not as above and disc never coarsely and transversely wrinkled.....7
7. Color usually dark castaneopiceous, the thorax lighter; above densely hairy; clypeus long and flat, hardly narrowed at front, apex only faintly reflexed; thorax with a broad, longitudinal impunctate band at middle; scutellum entirely and densely hairy; Louisiana, Arkansas, and Texas.....*robusta* LeConte
   Color usually testaceous or rufocastaneous, often with castaneous cloudings; clypeus definitely narrowed apically; thorax without broad impunctate band.....8
8. Scutellum strongly punctate; pygidium finely and entirely scabrous in basal two-thirds or more (and rarely even to apex), apical area usually densely punctate but polished and smooth between punctures; common California and Arizona, rare New Mexico and Texas.....*pasadenae* (Casey)
   Scutellum punctate or not; pygidium usually not alutaceous or cribrose in more than basal third or fourth; eastern species, rarely west to Texas.....9
9. Pygidium very sparsely and finely punctate the punctures of center disc hard to see, disc usually surface smooth and hairy (frequently hairs nearly entirely worn off); scutellum coarsely and usually densely and setigerously punctate (genitalia Fig. 1, *q* through *u*); Arkansas and eastern United States.
   borealis Arrow
   Pygidium minutely cribrate at least near base the punctures of center disc coarse and obvious; disc denser punctured than *borealis;* scutellum impunctate or very sparsely punctured with apical half usually smooth (genitalia Fig. 1, *y* and *z*); North Carolina and Georgia, west to Kansas and Texas.
   immaculata Oliver

KEY TO THE FEMALES

(Females of *knobelae* and *setidiosa* not included)

1. Hind tarsus much shorter than tibia, or at least definitely shorter; head with the front

coarsely, moderately densely punctured, not rugose; clypeus long and subtruncate, apex reflexed, disc coarsely transversely cribrate; pygidium entirely and cribrately punctate . 2

Hind tarsus subequal to or longer than tibia . . 3

2. Antennal club ovate and short, length of club 2–3 times as long as width through middle of leaves; elytra testaceous and thorax almost always red (very rarely black); western United States and Central America. *dimidiata* Burmeister

Antennal club long and slender, length of club 4–5 times as long as width through middle of leaves; color always testaceous with thorax a little rufous; Arizona, California, Lower California . . . . . *longula* LeConte

3. Clypeus highly polished and smooth, hardly punctate or very finely punctured; front tibia bidentate with an obsolete upper tooth; pygidium very finely and sparsely punctured and polished; Georgia, Alabama, and Florida . . . . . *puberula* LeConte

Clypeus always densely punctured 4

4. Body very robust; clypeal disc uneven, suddenly depressed at and on the strongly bisinuate suture, the disc very coarsely and entirely rugosely punctate; clypeus strongly narrowed in apical entirely rugosely punctate; clypeus strongly narrowed in apical half; ligula narrowed to a broad but sharp point; California and Nevada east to Texas. *hirta* LeConte

Body smaller and much less robust; clypeus and head not as above; ligula never exactly pointed at apex 5

5. Elytra at middle of lateral margin with a slight to strong, but very discernible, explanate and lobate callus, especially noticeable, when not well developed, in ventral-lateral view, and here the sudden widening of margin is distinct 6

Elytra without a lateral callus or enlargement. 7

6. Lateral swelling of elytra usually rather large and quite noticeable; sides and basal corners of pygidium very coarsely cribrate; *mentum usually definitely flat;* eastern States west to Texas . . . . . *immaculata* Oliver

Lateral swelling of elytra usually narrow though obvious if looked for; *mentum* and part of ligula usually rather strongly *convex* or at least noticeably convex; Arkansas and eastern United States . . . . . *borealis* Arrow

7. Color dark castaneous, thorax rufous, usually strongly pilose above, especially the elytra (hairs often abraded); clypeus strongly narrowed from the base; uncommon in Louisiana and Arkansas . . . . . *robusta* LeConte

Color testaceous to rufotestaceous, with castaneous cloudings; glabrous above; clypeus narrowed from about the middle; common in California, Lower California, and Arizona, east to Texas . . . . . *pasadenae* (Casey)

Cyclocephala knobelae (Brown)

Ochrosidia knobelae Brown, p. 23; Sanderson, 1940, p. 380.

I have not seen this species, and the notes are taken from Sanderson. Described from Hope, Ark., and not taken since to my knowledge. The small size (9 mm) and the singly toothed (apical tooth only present) front male tibia should readily separate the species. The genitalia as pictured by Sanderson are allied to those of *hirta*, but the paramere base is narrower here and the sides are evenly rounded near base.

Cyclocephala dimidiata Burmeister

Cyclocephala dimidiata Burmeister, 1847, p. 57; Sanderson, 1940, p. 379; Casey, 1915, p. 161 (*Dichromina*); Saylor, 1937, p. 70 (*Dichromina*).
Ochrosidia ocularis Casey, 1915, p. 162. (New synonymy.)
Cyclocephala elegans Horn, 1871, p. 337; Casey, 1915, p. 162 (*Dichromina*). (New synonymy.)

This common species ranges from Arkansas and through the southwestern United States, to Mexico and Central America and South America. Damages green fruits and leaves of fruit trees; roses and walnuts in California are frequently damaged or defoliated. The grass roots of lawns or golf greens are commonly attacked. Closely related to *longula* in the male genitalia (a little longer parameres there), this species differs mainly in the constant coloration as well as the ovate antennal club, the same being very well developed in *longula*.

Cyclocephala puberula LeConte

Cyclocephala puberula LeConte, 1863, p. 80; Casey, 1915, p. 147 (*Ochrosidia*).

I have seen specimens of this relatively uncommon species from Georgia, Alabama, and Florida. The male genitalia are near those of *hirta*, but externally the species are very different.

Cyclocephala setidiosa LeConte

Cyclocephala setidiosa LeConte, 1856, p. 79; Casey, 1915, p. 158 (*Ochrosidia*).

An uncommon species from Mississippi, Alabama, and Georgia. The male genitalia are exactly the same as *longula*, but externally the species are quite different: in *longula* the mid-apical thoracic margin is definitely but ob-

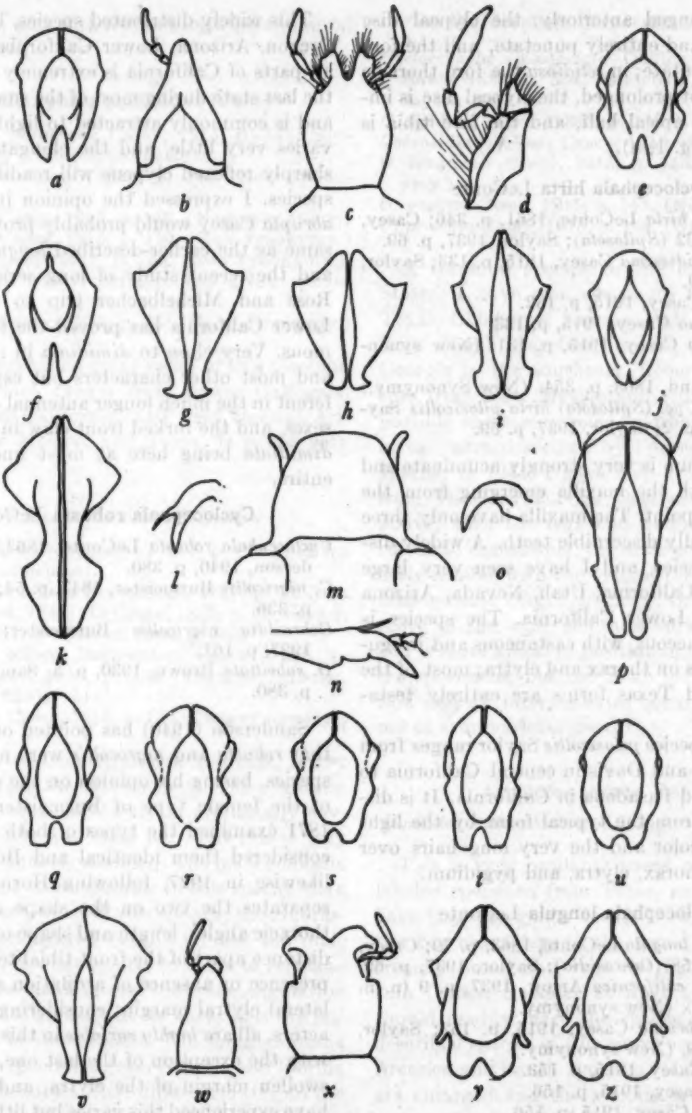


Fig. 1.—*a*, Male genitalia of *Cyclocephala hirta*; *b*, ligula of *Coscinocephalus cribrifons*; *c*, ligula of *Ancognatha manca*; *d*, maxilla of *Coscinocephalus cribrifons*; *e*, male genitalia of *Cyclocephala pasadenae*; *f*, male genitalia of *C. robusta*; *g*, male genitalia of *C. longula*; *h*, male genitalia of *C. dimidiata*; *i*, male genitalia of *Ancognatha manca*; *j*, male genitalia of *Cyclocephala puberula*; *k*, male genitalia of *Dyscinetus morator*; *l*, front male claw of *Cyclocephala dimidiata*; *m*, head and clypeus of male *C. longula*; *n*, front tibia of male *C. setidiosa*; *o*, front claw of male *C. longula*; *p*, male genitalia of *Coscinocephalus cribrifons*; *q*, male genitalia of *Cyclocephala borealis* (typical form, from Pennsylvania); *r*, same, from Malcolm, Nebr.; *s*, same, from Egypt, Ga.; *t*, same from Egypt, Ga.; *u*, same, from Orlando, Fla.; *v*, male genitalia of *Dyscinetus picipes*; *w*, male ligula of *Cyclocephala hirta*; *x*, male lingula of *Ancognatha manca*; *y*, male genitalia of *Cyclocephala immaculata* (commonest form, from Georgia), *z*, same, from Texas.

tusely prolonged anteriorly, the clypeal disc is coarsely and entirely punctate, and the fore tibia is tridentate; in *setidiosa* the fore thoracic margin is not prolonged, the clypeal disc is impunctate in apical half, and the fore tibia is different (Fig. 1, *n*).

Cyclocephala hirta LeConte

Cyclocephala hirta LeConte, 1861, p. 346; Casey, 1915, p. 132 (*Spilosota*); Saylor, 1937, p. 69.
Spilosota palidissima Casey, 1815, p. 133; Saylor, 1937, p. 69.
S. magister Casey, 1915, p. 132.
S. inconspicua Casey, 1915, p. 133.
S. nubeculina Casey, 1915, p. 131. (New synonymy.)
S. lurida Bland, 1863, p. 354. (New Synonymy.)
Subspecies: *Cyc.* (*Spilosota*) *hirta pilosicollis* Saylor, 1936, p. 2; Saylor, 1937, p. 69.

The mentum is very strongly acuminate and pointed, with the maxilla emerging from the sides of the point. The maxilla have only three minute, hardly discernible teeth. A widely distributed species, and I have seen very large series from California, Utah, Nevada, Arizona Texas, and Lower California. The species is usually testaceous, with castaneous and irregular cloudings on thorax and elytra; most of the Arizona and Texas forms are entirely testaceous.

The subspecies *pilosicollis* Saylor ranges from Sacramento and Davis in central California to Burbank and Pasadena in California. It is distinguished from the typical form by the light testaceous color and the very long hairs over the front, thorax, elytra, and pygidium.

Cyclocephala longula LeConte

Cyclocephala longula LeConte, 1863, p. 79; Casey, 1915, p. 158 (*Ochrosidia*); Saylor, 1937, p. 69.
Cyclocephala californica Arrow, 1937, p. 9 (n. n. for *rustica*). (New synonymy.)
Ochrosidia abrupta Casey, 1915, p. 152; Saylor, 1937, p. 69. (New synonymy.)
O. phasma Casey, 1815, p. 153.
O. obesula Casey, 1915, p. 156.
O. oblongula Casey, 1915, p. 156.
O. rustica Casey, 1915, p. 157 (not Ol. 1789).
O. reflexa Casey, 1915, p. 153.
O. marcida Casey, 1915, p. 155. (New synonymy.)
O. rugulifrons Casey, 1915, p. 154. (New synonymy.)
O. prona Casey, 1915, p. 157. (New synonymy.)
O. ambiens Casey, 1915, p. 155. (New synonymy.)
O. modulata Casey, 1915, p. 154. (New synonymy.)
Cyclocephala abrupta Casey, Ritcher, 1944, p. 17, (larva).

This widely distributed species, known from Oregon, Arizona, Lower California, Utah, and all parts of California is extremely common in the last state during most of the summer nights and is commonly attracted to light. The color varies very little, and the elongate form and sharply reflexed clypeus will readily place the species. I expressed the opinion in 1937 that *abrupta* Casey would probably prove to be the same as the earlier-described *longula* LeConte and the recent study of long series from the Ross and Michelbacher trip to all parts of Lower California has proved the two synonymous. Very close to *dimidiata* in male genital and most other characters but especially different in the much longer antennal club of both sexes, and the forked front claw in the male of *dimidiata* being here at most finely cleft, or entire.

Cyclocephala robusta LeConte

Cyclocephala robusta LeConte, 1863, p. 79; Sanderson, 1940, p. 380.
C. nigricollis Burmeister, 1847, p. 54; Horn, 1871, p. 336.
Ochrosidia nigricollis Burmeister; Buchanan, 1927, p. 167.
O. subvittata Brown, 1930, p. 5; Sanderson, 1940, p. 380.

Sanderson (1940) has pointed out his belief that *robusta* and *nigrocollis* were not the same species, basing his opinion on the examination of the female type of Burmeister's. Horn in 1871 examined the types of both species and considered them identical and Buchanan did likewise in 1927, following Horn. Sanderson separates the two on the shape of the front thoracic angles, length and shape of hind spurs, distance apart of the front tibial teeth, *and* the presence or absence of a dilation at middle of lateral elytral margin; considering these characters, all are *highly variable* in this large genus, with the exception of the last one, namely the swollen margin of the elytra, and so far as I have experienced this varies but little; therefore the two species may be different, but it will be necessary to secure series and males to be really sure. The species is known from Louisiana, Arkansas, and Texas. A single male recently collected on cotton at Lavaca, Tex., is this species, although appearing quite different in color: entirely testaceorufous above with a broad castaneous stripe adjoining the elytral suture, and also coloring the apical eighth of

the elytra, and with a small dark posthumeral umbo spot.

Cyclocephala pasadenae (Casey)

Ochrosidia pasadenae Casey, 1915, p. 148; Saylor, 1937, p. 70 (*Cyclocephala*).
O. arizonica Casey, 1915, p. 149 (New synonymy.)
O. melina Casey, 1915, p. 149. (New synonymy.)
O. pusilla Casey, 1915, p. 150. (New synonymy.)
O. facilis Casey, 1915, p. 150. (New synonymy.)
O. validiceps Casey, 1915, p. 148. (New synonymy.)
O. ovatula Casey, 1915, p. 151. (New synonymy.)

I have examined great series of this common species, which ranges from Lower Calfornia, throughout California, and west through Arizona, New Mexico, and Texas. It is not very variable.

Cyclocephala borealis Arrow

Cyclocephala borealis Arrow, 1937, p. 172 (n. n. for *villosa* Burmeister).
Cyclocephala villosa Burmeister, 1847, p. 54 (non Blanchard, 1846); LeConte, 1863, p. 79; Saylor, 1937, p. 69; Sanderson, 1940, p. 382.
Ochrosidia villosa Burmeister, Casey, 1915, p. 147; Hayes, 1918, p. 135 (biology); Ritcher, 1944, p. 18 (larva).
O. parallela Casey, 1915, p. 144. (New synonymy.)

Distributed from Arkansas and east, rather common along the eastern coast. The pygidium and apical areas of the elytra are usually covered with long and erect hair, but this is very frequently entirely abraded. The male genitalia appear to be more variable in this species than in any other United States species; the Nebraska specimen figured (Fig. 1, *r*) has the male genitalia somewhat similar to those of *immaculata*, but the small lateral toothlike angulation is not sinuate apically at its base, as is the lateral tooth in *immaculata*. The male genitalia of *parallela* specimens from Georgia and Florida look superficially a little different owing to the more rounded lateral process of the parameres, but the slight variations as shown in the two figures of the Georgia specimens (Fig. 1 *s* and *t*), plus the figure of the Florida specimens (Fig. 1, *u*) show how the small notch between the small submedian tooth (or toothlike dilation) and the more basal dilation is filled in, and how the resulting rounder and less-incised genitalia is that of an entirely different-appearing species.

Cyclocephala immaculata Olivier

Cyclocephala immaculata Olivier, 1789, p. 29; Bates, 1888, p. 334; Sanderson, 1940, p. 384; Saylor, 1937, p. 70.
C. frontalis Sturm, 1843, p. 116.
Ochrosidia rufifrons Casey, 1915, p. 145.
O. tenuicutis Casey, 1915, p. 146. (New synonymy.)
O. pagana Casey, 1915, p. 148. (New synonymy.)
O. protenta Casey, 1915, p. 144. (New synonymy.)

A common species in the eastern United States; I have seen specimens from Missouri, Texas, Oklahoma, Kansas, and Arkansas, and from North Carolina, South Carolina, and Georgia in the southeast. Recorded in literature from New Mexico and Guadeloupe, but possibly these may refer to other species. The larvae were described by Forbes in 1894 and Ritcher in 1944. I have seen a male specimen from Thomasville, Ga., that is entirely black above, with the legs and abdomen testaceorufous to castaneous; the male genitalia are exactly similar with the typical form. As the figures indicate (Fig. 1, *y* and *z*), the small lateral tooth of the male genitalia varies in position and is more apical in position in the more eastern specimens, but this is an individual variation and all intermediates occur so that it is not of even varietal import.

Aspidolea texana Höhne

Aspidolea texana Höhne, 1912, p. 84.

This is very probably based on a wronglylabeled specimen from Texas, as I do not believe that the genus occurs here: if it should, the key characters to the genus, plus the extremely broad and very flat ligula and mentum (which is wider at apex than at base) should readily place the species. All other 13 described species of this genus occur in Central America and South America. Male front claws are enlarged and the maxilla is unarmed. *A. texana* was described from San Antonio, Tex., and was a unique female 15 mm long and reddish brown, with the forehead and vertex black.

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ENTOMOLOGY.—Scheloribates chauhani, *a new species of oribatid mite from India (Acarina: Ceratozetidae)*.[1]

EDWARD W. BAKER, United States Department of Agriculture. (Communicated by C. F. W. MUESEBECK.)

The discovery that *Zetes emarginatus* (Banks),[2] family Galumnidae, is an intermediate host of the sheep tapeworm, *Moniezia expansa* (Rudolphi), has aroused much interest in the oribatid mites during the past few years. This species, which lives on grass in sheep pastures, was found to be infected with the cysticercoidal stage of the parasite.

B. S. Chauhan, of the Zoological Survey of India, while conducting studies on the sheep tapeworm, has collected oribatid mites from grass. However, these mites belong to the genus *Scheloribates*, family Ceratozetidae, and appear to represent a new species.

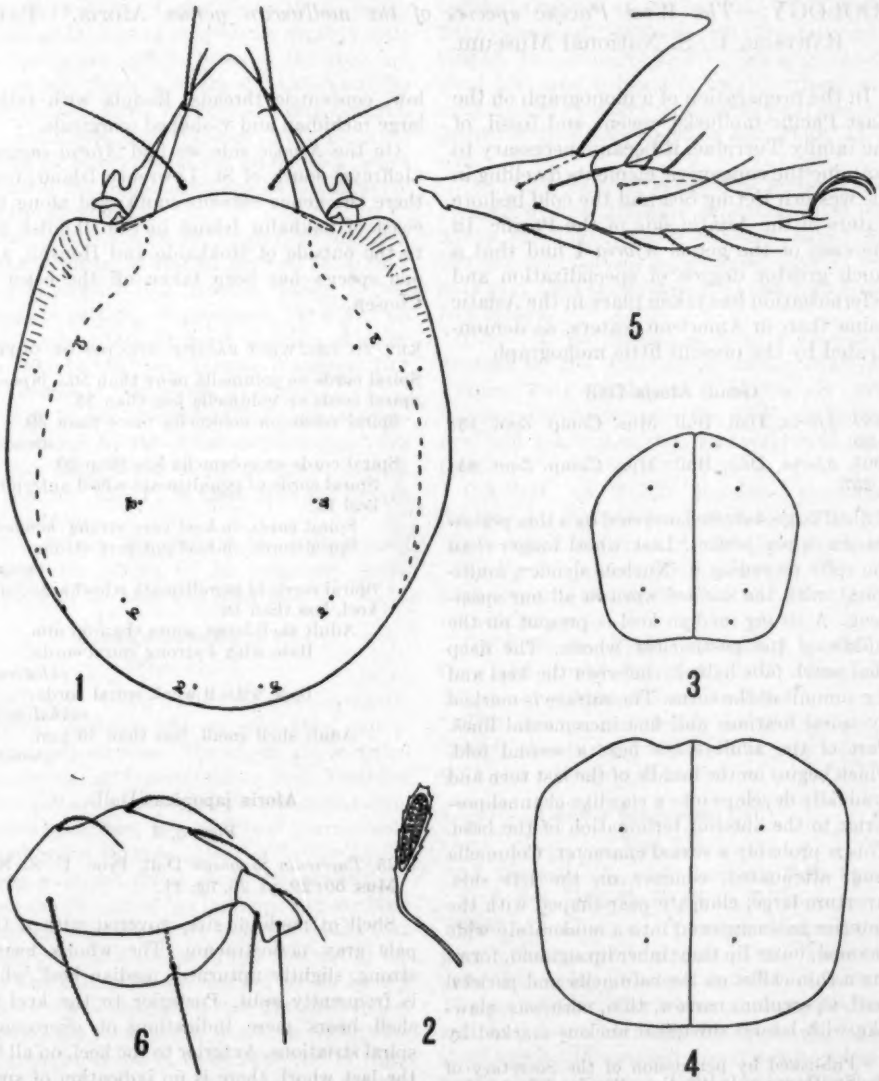
Scheloribates chauhani, n. sp.

Female.—Abdomen round-oval; all cephalothoracic bristles barbed, the interlamellar setae inserted nearer to edge of notogaster than to lamellae and longer than others; lamellae tapering distally, not undulate externally, and sides of cephalothorax not or barely visible from above; translamellar lines short; lamellorostral ridge well developed and embracing base of rostral bristle; each pseudostigma with rim usually slightly surpassing edge of pteromorpha, pseudostigmatic organs with head equal to length of pedicel, "oil globules" present, barbs small but distinct. Abdomen with anterior edge of notogaster mildly bowed, its sides merging into pteromorphae; dorsum of abdomen equally arched when viewed from side; pteromorphae with a bristle on anterodorsal area, and with radial combings or fine corrugations on shoulders; dorsal setal pits as figured (body setae apparently knocked off); anal plates wider than long, sides almost parallel, posterior cover bristles closer to inner edge than are anterior bristles, and bristles subequally spaced from anterior and posterior edges; genital plates slightly wider than long, broadly rounded anteriorly, and only slightly concave posteriorly, setae arranged as figured, lateral margins longer than anterior margins. Tarsus I with ventral ciliate setae, dorsal simple setae, and a short rodlike dorsal setae as

[1] Received October 9, 1945.
[2] H. W. STUNKARD, Science 86: 312. 1937; W. H. KRULL, Proc. Helminth. Soc. Washington 6 (1): 10, 11. 1939.

figured; femur II as figured, all setae barbed, the posterior dorsal seta barely reaching past base of median seta; the dorsal posterior angle of femur rather abrupt; tectopodium III notched but not strongly so; sides of tectopodia II mildly converging toward rostrum. Length of body 533μ, width 393μ.

Scheloribater chauhani differs from *S. indica* Oudemans, which is from Ceylon, in having pectinate cephalothoracic setae and in having an elongate pseudostigmatic organ that is distinctly barbed. It differs from *S. muiri* Jacot, a Hawaiian species, in having all cephalothoracic setae pectinate, in having a rounded



FIGS. 1–6.—*Scheloribates chauhani*, adult female: 1, Dorsal view of body; 2, pseudostigmatic organ, 3, genital plates; 4, anal plates, 5, tarsus and tibia I; 6, femur II.

rather than a pointed genital opening, in having the lateral margins of the genital plate longer than the anterior margins, in the setal arrangement of the anal plates, in that the posterior dorsal setae of femur II does not reach the base of the anterior seta, and in femur II having an abrupt rather than a gentle posterior dorsal angle.

The type, U.S.N.M. no. 1515, and 10 paratypes, which were sent in by B. S. Chauhan and named for him, were collected from grass, Izatnagar (Bareilly), U. P., India.

ZOOLOGY.—*The West Pacific species of the molluscan genus* Aforia.[1] PAUL BARTSCH, U. S. National Museum.

In the preparation of a monograph on the East Pacific mollusks, recent and fossil, of the family Turridae, it became necessary to examine the congeneric elements dwelling in the western Bering Sea and the cold inshore waters of the Asiatic side of the Pacific. In the case of the genus *Aforia* I find that a much greater degree of specialization and differentiation has taken place in the Asiatic fauna than in American waters, as demonstrated by the present little monograph.

Genus **Aforia** Dall

1889. *Aforia*, Dall, Bull. Mus. Comp. Zool. **18**: 99.

1908. *Aforia*, Dall, Bull. Mus. Comp. Zool. **43**: 257.

Shell large, turreted, covered by a thin periostracum when perfect. Last whorl longer than the spire preceding it. Nucleus slender, multispiral, with the surface worn in all our specimens. A strong median keel is present on the middle of the postnuclear whorls. The deep anal notch falls halfway between the keel and the summit of the turns. The surface is marked by spiral lirations and fine incremental lines. Part of the adult shells bear a second fold, which begins on the middle of the last turn and gradually develops into a clawlike channel posterior to the anterior termination of the base. This is probably a sexual character. Columella long, attenuated, concave on the left side. Aperture large, elongate pear-shaped with the anterior half narrowed into a moderately wide channel; outer lip thin; inner lip sigmoid, forming a thin callus on the columella and parietal wall. Operculum narrow, thin, corneous, clawlike with lateral subapical nucleus marked by low, concentric threads. Radula with rather large rachidian and Y-shaped marginals.

On the Asiatic side we find *Aforia insignis* (Jeffreys) south of St. Lawrence Island; from there the genus extends southward along the coast of Sakhalin Island in the Okhotsk Sea to the outside of Hokkaido and Honshu, and one species has been taken off the coast of Chosen.

KEY TO THE WEST PACIFIC SPECIES OF OOFRIA

Spiral cords on columella more than 50. . *japonica*
Spiral cords on columella less than 35.
  Spiral cords on columella more than 30. *diomedea*
  Spiral cords on columella less than 20.
    Spiral cords of penultimate whorl anterior to keel 18.
      Spiral cords on keel very strong. *hondoana*
      Spiral cords on keel not very strong. *insignis*
    Spiral cords of penultimate whorl anterior to keel, less than 16.
      Adult shell large, more than 60 mm.
        Base with 4 strong spiral cords. *okhotsensis*
        Base with 9 weak spiral cords. *sakhalinensis*
      Adult shell small, less than 46 mm. *chosensis*

Aforia japonica (Dall)

Figs. 5, 6

1925. *Turricula japonica* Dall, Proc. U. S. Nat. Mus. **66**: 29, pl. 26, fig. 11.

Shell of medium size, covered with a thin pale gray periostracum. The whorls bear a strong, slightly upturned, median keel, which is frequently split. Posterior to the keel the shell bears mere indications of microscopic spiral striations. Anterior to the keel, on all but the last whorl, there is no indication of spiral sculpture. On the last whorl, however, anterior

[1] Published by permission of the Secretary of the Smithsonian Institution. Received September 17, 1945.

to the keel, numerous, feebly incised, spiral lines are present, of which about 24 appear on the base and more than 50 on the columella. On the anterior fourth of the columella they disappear altogether. In addition to this, the base and columella are marked by strong incremental lines, which give to the surface a somewhat clothlike texture. Aperture extremely elongate-pyriform. Outer lip with a deeply incised sinus, having its greatest depth a little anterior to the middle between the keel and the summit. Anterior to the sinus the outer lip is protracted. Inner lip very elongate-sigmoid. The columella and parietal wall rendered smooth by resorption at the inner lip. The left outline of the base and columella is concavely slightly sigmoid.

The type, U.S.N.M. no. 205041, was dredged by the *Albatross* at station 5088 off Joka Sima Light in Sagami Bay, Honshu, Japan, in 369 fathoms; bottom temperature, 41.8°F., on green mud bottom. It has 8 whorls and measures: Height, 53 mm; greater diameter, 18.1 mm; length of last whorl, 34.3 mm.

U.S.N.M. no. 205038 contains a young specimen dredged by the *Albatross* at station 5093 off Joka Sima Light in 302 fathoms; bottom temperature, 43.9°F., on black sand and broken shell bottom.

This species can readily be distinguished from all the others by its extremely feeble sculpture of the base and columella.

Aforia diomedea, n. sp.

Figs. 11, 12

Shell very large, rather narrow, elongate-turreted, covered with a pale gray, putty-colored periostracum. The whorls are encircled by a strong, up turned median keel. Posterior to the keel are 2 spiral threads and more microscopic spiral lines. The keel itself bears closely spaced spiral threads. Anterior to the keel 7 strong, rounded spiral cords are present between the summit of the last turn and the keel. These are a little broader than the spaces that separate them. Anterior to this the rest of the base and columella are marked by 40 incised grooves which separate rather flattened spaces of about the same width or a little wider than the grooves. Some of these bear one to three fine incised lines. In addition to this the entire base and columella are marked by incremental lines. Aperture elongate pear-shaped. Outer lip with a deep sinus a little anterior to the middle between the summit and keel, protracted anteriorly to the keel. The inner lip is decidedly sinuous and by resorption causes the columella and parietal wall to appear as a glazed surface. The left side of the base and columella is decidedly concave.

The type, U.S.N.M. no. 205039, was dredged by the *Albatross* at station 5044 off Yerimo Zaki, southeast Hokkaido, in 309 fathoms; bottom temperature, 32.1°F., on gray sand, coral and sand bottom. It has 8.5 whorls remaining and measures: Height, 92 mm; greater diameter, 30.6 mm; length of last whorl, 51.1 mm.

U.S.N.M. no. 205036 contains 2 specimens dredged by the *Albatross* at station 5050 off Kinka San Light east of Sakhalin Island, in 266 fathoms; bottom temperature, 37.9°F., on dark gray sand and broken shell and Foraminifera bottom.

U.S.N.M. no. 205040 contains 1 specimen dredged by the *Albatross* at station 5045 off Yerimo Zaki southeast Hokkaido, in 359 fathoms; bottom temperature, 38°F., on brown mud and fine broken shell and coral sand bottom.

U.S.N.M. no. 205037 contains 1 specimen dredged by the *Albatross* at station 5051 off Kinka San Light, east of Sakhalin Island, in 399 fathoms; bottom temperature, 38.1°F., on dark gray sand and broken shell and Foraminifera bottom.

U.S.N.M. no. 342737 contains 1 specimen from the Hirasé collection (1402) taken at Rikuzen northeast of Honshu, Japan.

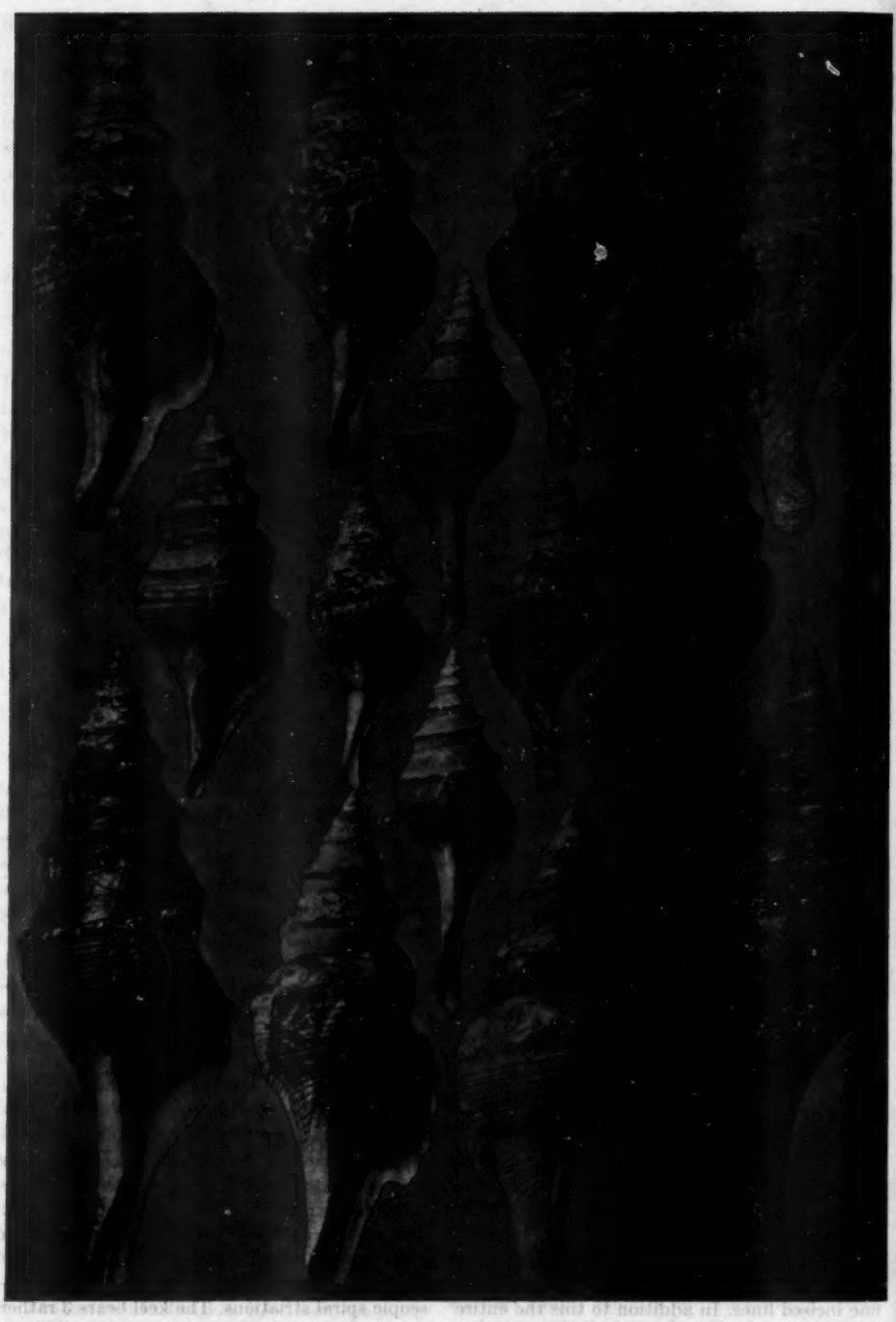
This species can readily be distinguished from all the others by its large size, gray coloration, and perfection of sculpture.

Aforia hondoana (Dall)

Figs. 7, 8

1925. *Turricula* (*Surcula*) *hondoana* Dall, Proc. U. S. Nat. Mus. 66: 29–30, pl. 31, fig. 6.

Shell of medium size, turreted, covered by a gray periostracum. Interior of the aperture yellowish white. Nuclear whorls decollated. The postnuclear whorls bear a strong median keel, anterior to which the whorls are slopingly shouldered and marked by obsolete microscopic spiral striations. The keel bears 3 rather strong spiral threads. Anterior to the keel the whorls are marked by 6 very strong spiral



FIGS. 1–14.—West Pacific species of the genus *Aforia*. 1, 2, *A. okhotskensis*, n. sp.; 3, 4, *A. sakhalinensis*, n. sp.; 5, 6, *A. japonica* (Dall); 7, 8, *A. hondoana* (Dall); 9, 10, *A. chosenensis*, n. sp.; 11, 12, *A. diomedea*, n. sp.; 13, 14, *A. insignis* (Jeffreys). All about ×1¼.

cords which are separated by deep grooves not quite as wide as the cords. The base is well rounded and bears 7 very strong spiral cords also separated by deeply incised grooves. The columella is moderately long and bears 18 spiral cords which become progressively finer anteriorly. Aperture pear-shaped. The posterior sinus falls on the shoulder and is deep, broad, and rounded at base. Anterior to the keel the outer lip is protracted and rendered sinuous by the external sculpture. The inner lip is covered with a thick callus which somewhat covers the parietal wall.

The type, U.S.N.M. no. 111052, was dredged by the *Albatross* at station 5087 in Sagami Bay off Hondo, Japan, in 614 fathoms on mud bottom; bottom temperature 37.5°F. It has 6.5 whorls remaining and measures: Height, 56.2 mm; greater diameter, 21.5 mm; length of last whorl, 31.4 mm.

This species in general shape and sculpture most nearly resembles *A. insignis* from which its much smaller size and much stronger spiral sculpture will readily distinguish it.

Aforia insignis (Jeffreys)

Figs. 13, 14

1883. *Pleurotoma insignis* Jeffreys, Ann. Mag. Nat. Hist. 1883: 119–120.

Shell large, turreted. The patches of periostracum remaining show this to have been reddish brown. The interior of the aperture is ochre yellow. Nuclear whorls decollated. The postnuclear whorls are marked by a strong median keel which bears 5 fine spiral threads. Anterior to this keel the whorls are well rounded and marked by decidedly sinuous incremental lines which show that the posterior sinus is deep and broad. Anterior to the keel are 2 slender spiral threads equaling those on the keel in strength. This area is impressed and forms a slight groove. Anterior to this the whorls are marked by 7 spiral cords which are of somewhat varying strength and which are separated by deeply impressed narrow grooves. The base is well rounded and also bears 7 spiral cords equaling those of the spire in strength. Some of these are marked medially by a fine incised spiral line. The columella is long and bears 18 spiral cords which are of subequal strength. The axial sculpture consists of incremental lines only which are rendered decidedly sigmoid due to the deep posterior sinus. In the specimen described, the last portion of the last whorl embracing the anterior 4 spiral cords, becomes somewhat folded and projects at the peristome as a slight claw. Aperture pear-shaped. Outer lip with a deep broad sinus on the shoulder, protracted anterior to the keel, and rendered somewhat sinuous by the external sculpture. The inner lip is covered with a thick callus, which extends over the parietal wall.

The specimen described and figured, U.S. N.M. no. 190815, comes from the Jeffreys collection and is one of 10 collected on the Vega Expedition in the Icy Sea of Siberia. It was used as the basis for Jeffreys' description and may therefore be considered the type of the species. It has 7.5 whorls remaining and measures: Height, 72.4 mm; greater diameter, 27.8 mm; length of last whorl, 41.5 mm.

In the elements of sculpture it most nearly resembles *A. hondoana*, from which, however, its larger size and less strong spiral sculpture will readily distinguish it.

Aforia okhotskensis, n. sp.

Figs. 1, 2

Shell large, turreted, interior pale buff, exterior covered by a thin gray periostracum, which is eroded in most part. A strong median spiral keel almost midway between summit and suture is present. Posterior to this keel the surface is marked by incremental lines and spiral lirations about as strong as the incremental lines. The anal sinus falls a little nearer the keel than the summit. Anterior to the keel the last whorl is rough and marked by deeply incised grooves which leave broad, rather rough, flattened spaces between them. Of these grooves, 8 are present between the keel and the insertion of the columella, the one bordering the keel being the deepest. On some of the spaces between these deep grooves there are indications of a median, secondary, less strong groove, while the keel itself is marked by finer spiral threads. The rather protracted columella is marked by 8 deeply impressed, spiral grooves which separate spaces about as wide as those on the base. In the anterior portion of the columella they seem to disappear. In addition to this, the columella and base are marked by strong incremental lines. In the type there is a secondary spiral ridge about as far anterior to the keel as that is from the summit, which corresponds to a secondary notch in the outer lip.

Aperture very elongate pear-shaped with the anal sinus deeply incised. Anterior to this the outer lip is protracted; the inner lip is decidedly sigmoid, while the left outline of the base and columella is decidedly concave.

The type, U.S.N.M. no. 205042, was dredged by the *Albatross* at station 5020 off the east coast of Sakhalin Island near Cape Patience, Okhotsk Sea, in 73 fathoms; bottom temperature, 30.9°F., on green mud, sand, and pebbly bottom. It has 7.5 whorls remaining and measures: Height, 73.8 mm; greater diameter, 28.5 mm; length of last whorl, 43 mm.

U.S.N.M. no. 205044 contains a young specimen dredged by the *Albatross* at station 5005 in Aniwa Bay on the east side of Sakhalin Island, Okhotsk Sea, in 42 fathoms; bottom temperature, 42°F., on green mud and fine gray sand bottom.

This species most nearly resembles *A. insignis* from which it can be distinguished by its much coarser spiral sculpture.

Aforia sakhalinensis, n. sp.

Figs. 3, 4

Shell turreted, covered with a thin pale buff periostracum. Interior of aperture with an ochre flush. The whorls bear a strong median keel, anterior to which they are covered by fine microscopic hair lines and strongly sigmoid incremental lines of about the same strength, which follow the outline of the anal sinus. The anterior termination of the keel consists of a deeply impressed groove. The keel itself is crossed by fine spiral lines. Anterior to this groove the whorls are crossed by 14 incised grooves, which vary from mere lines to rather broad flat channels. The grooves and flattened spaces between them are crossed by rather strong incremental lines, which in the broad grooves assume the strength of hair lines. The columella is also marked by spiral grooves, of which 15 are present. The spaces enclosed by these are more rounded than those on the base, the axial incremental lines being of the same strength. On the extreme tip of the columella the spiral sculpture gradually fades out. Aperture elongate-pyriform; outer lip with a deep sinus whose greatest depth is a little nearer the keel than the summit of the whorls. The outer lip is protracted anteriorly to the keel. The inner lip is decidedly sinuous and covers the columella and parietal wall as a smooth resorption area. The left outline of the base and columella is decidedly concave.

The type, U.S.N.M. no. 573613, was dredged by the *Albatross* at station 5051 off Kinka San Light east of Sakhalin Island in 399 fathoms; bottom temperature, 38.1°F., on dark gray sand and broken shell and Foraminifera bottom. It has 7.5 whorls remaining and measures: Height, 63.8 mm; greater diameter, 24 mm; length of last whorl, 36.3 mm.

U.S.N.M. no. 573614 contains a young specimen dredged by the *Albatross* at station 5050 off Kinka San Light east of Sakhalin Island, in 266 fathoms; bottom temperature, 37.9°F., on dark gray sand and broken shell and Foraminifera bottom.

This species most nearly resembles *A. chosenensis* but can readily be distinguished from that by its less strong basal sculpture and larger size.

Aforia chosenensis, n. sp.

Figs. 9, 10

Shell small, turreted, the exterior covered with a grayish buff, thin periostracum. Interior of the aperture pale buff. The whorls bear a strong, decidedly elevated, median keel, posterior to which the slightly concave surface is marked by decidedly sigmoid lines of growth and microscopic spiral striations. Anterior to the keel the shell and the base and columella are marked by deeply incised, rather broad grooves which are a little more distantly spaced immediately below the keel than on the rest of the shell. These grooves enclose almost flattened areas which are a little narrower near the keel than on the rest of the surface. Eleven of these are present between the keel and the insertion of the columella, and 12 more on the columella where they gradually grow weaker anteriorly. In addition to this, the entire surface is marked by fine microscopic spiral striations and lines of growth. The latter appear almost as hair lines in the deep grooves. The keel itself is marked by fine spiral threads. The base of the last whorl and columella are decidedly concave on the left side. Aperture rather narrow, very elongate pear-shaped with a deep sinus a little anterior to the middle above the shoulder. The outer lip is protracted anterior to the keel and rendered somewhat sinuous by the external sculpture. The inner

lip is elongate-sigmoid. The columella is excavated into a smooth surface which also extends over the parietal wall.

The type, U.S.N.M. 205043, was collected by the *Albatross* at station 4860 off Cape Clonard, southeast coast of Chosen, Japan Sea, in 122 fathoms on gray mud bottom; bottom temperature 34.1°F. It has 6 whorls remaining and measures: Height, 45.5 mm; greater diameter, 18 mm; length of last whorl, 27.8 mm. U.S.N.M. no. 573615 contains another specimen from the same station.

The small size will readily distinguish this from the other Japanese members.

ZOOLOGY.—*On the oligochaete genus Syngenodrilus and its taxonomic relationships.*[1] G. E. GATES, Judson College, Rangoon, Burma. (Communicated by WALDO L. SCHMITT.)

The oligochaete *Syngenodrilus lamuensis* Smith and Green, 1919, from Mkonumbi near Lamu on the coast of British East Africa, is known only from the original description of a single specimen. This "remarkable" species is of especial interest because of a peculiar combination of characteristics: septa 9/10–10/11 combined, 11/12 united either with 9/10–10/11 or 12/13; pregonadic gizzards, intestinal origin in region of xii–xiii; paired testis sacs (containing hearts and nephridia) in x–xi, numerous small seminal vesicles, one pair of larger, elongated seminal vesicles extending posteriorly within the ovisacs to xx, three pairs of prostates none of which are associated with the male genital ducts. *Syngenodrilus* was placed by its authors in the Asiatic family Moniligastridae primarily "because of the various important characteristics in which it is allied with *Desmogaster*" but probably as much because of the one-cell-layered clitellum and yolky ova supposedly characteristic of the Moniligastridae alone among Megadrili. Differences from other Moniligastridae were recognized as sufficient to require division of the family into two subfamilies, the Moniligastrinae and Syngenodrilinae, the latter containing only *Syngenodrilus*. This classification was accepted by Michaelsen[2] and Stephenson, apparently without really critical examination. The necessity for such examination was recognized several years ago and a discussion of the problem was prepared for publication. There was, however, so much uncertainty with regard to a number of structures of taxonomic importance that it seemed advisable to postpone consideration of the problem until the type material could be studied. Although a sabbatical leave has permitted study of the original material, a considerable proportion of the uncertainty can not yet be resolved except as regards moniligastrid relationships.

The author's thanks are due to Prof. R. C. Osburn and the authorities of the Ohio State University for the courtesies of the Department of Zoology during the winter of 1940–41, and also to Dr. Waldo L. Schmitt, of the United States National Museum, for the opportunity afforded of examining the type material of *Syngenodrilus*.

Syngenodrilus lamuensis Smith and Green

1919. *Syngenodrilus lamuensis* F. Smith and B. R. Green, Proc. U. S. Nat. Mus. **55**: 145–153, figs. 1–8.

1930. *Syngenodrilus lamuensis*, J. Stephenson, The Oligochaeta, p. 813 (*vide* also pp. 339, 671, 688, 696–697, 716, and 808–811).

[1] In the collections of the U. S. National Museum is the unique type of an earthworm collected near Lamu on the eastern coast of British East Africa by William Astor Chanler in 1892 and described by Frank Smith and Bessie R. Green in the Proceedings of the U. S. National Museum, vol. 55, pp. 145–153, 1919, as a new genus and new species. Its taxonomic relationships have long intrigued students of the oligochaetes and as a result the type material has been critically reexamined in recent years by two specialists. The results of their observations are set forth in two papers, this one by Dr. G. E. Gates of Judson College, Rangoon, Burma, and the one immediately following by Dr. Grace E. Pickford, of the Osborn Zoological and Bingham Oceanographic Laboratories, Yale University.—W. L. SCHMITT.

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[2] Michaelsen (1928) placed *Syngenodrilus* in a separate family, the Syngenodrilidae, distinct from but supposedly closely related to the Moniligastridae.

Material examined.—The type material comprises a single specimen from which the right half of the anterior end to the region of segment xxiii was removed and serial sections of the right half, cut sagittally, on 10 slides.

Observations on the type specimen.—EXTERNAL CHARACTERISTICS: The prostomium appears to be protruded, but it and the first segment are softened and damaged. Because of the protrusion, recognition of a characteristic moniligastrid prolobous condition is impossible. Pigmentation and clitellar coloration as well as clitellar thickening are unrecognizable. Setae of segments xi, xii, and xiii are in part or wholly lacking. Close to approximate sites of ventral setae there is on each of segments xi–xiii a porelike marking that might be the aperture of a setal follicle but possibly is the opening of a prostate. Spermathecal apertures are minute, apparently immediately in front of 7/8 and 8/9, in region of *cd*. There is a minute, porelike marking on 12/13, about on *cd*, which may be the male pore, but a similar marking is present farther laterally on the anterior margin of xiii (nephropore or another male pore?). The female pore is a transversely placed slit on *a*, midway vetween the setal arc of xiv and 13/14.

INTERNAL ANATOMY: In the left half of the anterior portion remaining on the type is included the ventral nerve cord, all of one ovisac and most of another, two spermathecae, and (probably) two male funnels. Most of the digestive system behind 7/8 is lacking and blood vessels are broken. The gizzards and portions of the vascular system have been lost.

Behind the posteriormost prostate and about at level of 13/14 is a bit of membrane that presumably is 12/13. Coelomic cavity of xiii reduced to an ovarian chamber (?). Segment of intestinal origin not determinable. No typhlosole. Structures that look somewhat like moniligastrid enterosegmental organs are present on the intestine but may be only branches of vessels to the dorsal trunk from the intestine. "Hearts" of vi and vii connect the dorsal and ventral trunks to a longitudinal vessel that appears to be an extra-esophageal. Location of last heart not determinable.

The intact ovisac bends upward in the region of the prostate of xiii and in the upper half of the coelomic cavity bears at its anterior end a rosette-shaped, iridescent mass, presumably a male funnel. This funnel looks more like a megascolecid funnel than that of a moniligastrid worm. Sticky coagulum such as is always present in a moniligastrid testis sac around the male funnel is entirely lacking here. The anterior (?) male funnel is attached to a membrane that presumably represents the posterior wall of a testis sac. Both (?) testis sacs are open as a result of removal of median portions in halving. Testes, vasa deferentia, and seminal vesicles are unrecognizable. Strings of round bodies, presumably eggs, are in front of the anterior male funnel and are continuous, beneath and around the posterior face of the membrane bearing the funnel, with other egg strings. A small female funnel is present on the anterior face of 13/14 ventrally and a cord representing or containing the female duct passes from the posterior face of 13/14 into the parietes of xiv. Ovisacs are firm and apparently shrunken but at the posterior ends are several small, reddish to yellowish knobs or lobes. In a moniligastrid worm a similar collapsed condition of the ovisac, with but little yellowish material is evidence for a late postsexual condition. Spermathecal ampullae are shrunken and irregular, widest entally, not attached to the posterior faces of their septa as in the Moniligastridae. A short ectal portion of each spermatheca (duct) appears to be circular in cross section, with a thicker wall than the ampulla. There are no atria or diverticula recognizable. The prostates appear to be short tubular glands, shortly looped, with the loops pressed into contact, the glands bent posteriorly. The duct is probably confined almost entirely to the parietes.

The sections.—Portions of sections figured by Smith and Green are readily recognizable However, critical parts of the most important sections are lacking, and in remaining portions of these, as well as in other sections, delicate septa (or portions of septa) have been broken or lost. Accordingly any attempt at reconstruction scarcely seems feasible. A 4-day study of this portion of the material warrants only a few miscellaneous observations and suggestions.

Slight tension on delicate septa, in certain earthworms at least, is sufficient to rupture the membranes so that they are unrecognizable in dissections even when made with considerable care. It is quite possible then, even if if there had been no damage or loss during

sectioning, that strains incident to halving the type and washing dirt out from the gut might have been sufficient to disrupt if not destroy delicate membranes including some of the most important septa. Delicate septa might also have been ruptured in a process of sudden killing. In the moniligastrid genus *Drawida*, septal herniations permit one or both testis sacs to have an apparent location behind the ovarian segment, occasionally with a longitudinal deformation of a testis sac. Whether a similar sort of herniation is responsible for some of the peculiar appearances in sections of *S. lamuensis*, including that of seminal vesicles within the ovisacs, can not be determined from the material available. In any case, location of most of the right ovisac as well as one gizzard and part of another in the left half of the type, shows that some organs at least are distorted and not in a normally symmetrical condition. Just how extensive the distortion is can not be determined until normal specimens are available for comparison.

In view of admitted possibilities of "imperfectly developed" septa, of damage to sections, and the obvious presence of "evidence of more septa among the organs" it is difficult to imagine the reasons for an assumption of septal fusions by Smith and Green, and especially of the extensive type mentioned above. Presence of hearts and nephridia in x and xi would have prevented complete fusion, even in case of apposition of peripheral portions of certain septa. For a peripheral apposition of septa, as for instance in *Drawida* or *Hoplochaetella*, no evidence was recognized in the sections.

Determination of segmental location of the posterior hearts appears to be impossible. In some sections at least hearts appear to be present in xi and xii but lacking in x (as in certain species of *Pheretima*).

Intrasegmental location of testes and relationship of the male gonads to the anterior walls of the testis sacs, according to Smith and Green and so far as is determinable from the sections, appear to be of the sort normal to most Microdrili and Megadrili[3] and certainly are not of the moniligastrid type. (Note attachment of testes to anterior walls of testis sacs some distance in front of the male funnels and above the floors of the sacs, in fig. 3, Smith and Green, 1919, p. 149.) The position of the posterior male funnel in the sections is most peculiar. The ental-most portion of the associated male duct is dorsal to the funnel and runs posteriorly. The male funnel is horizontally elongated and faces ventrally with the back (closed face) of the funnel and duct attached dorsally. In most Megadrili the back of the funnel is directed posteriorly, while in the Moniligastridae the back is directed ventrally. In certain sections the posterior male funnel appears to be in xii. A definite statement as to paired or unpaired characterization of the testis sacs appears to be impossible though appearances seem to indicate that sacs are unpaired, i.e., there are only two sacs, one belonging to x and one to xi. Attention is also directed to the fact that in some species of *Pheretima* gonad septa may be herniated in such a way that testis sacs at first appear to be in xi and xii rather than x and xi. Essential portions of sacs of *S. lamuensis*, those containing male funnels and testes (or perhaps whole sacs?), are certainly subesophageal. In view of the condition of the sections little of value can be said regarding the segmental location of the testis sacs, except that no reason for questioning the location given by Smith and Green was recognized. If the posterior testes belong to xii (extremely improbable) as suggested by Stephenson, it would seem to be necessary to refer the anterior gonads to xi. The numerous small seminal vesicles probably are nothing more than aggregations of spermatozoa between folds of the male funnel. Seminal vesicles, if present, are of the posteriorly elongated, microdrilid type[4] as figured by Stephenson, 1930, pp. 728 and 741), rather than the vertically elongated megadrilid type (Stephenson, 1930, p. 329).

Remarks on the relationships of Syngenodrilus. —Comparison of *Syngenodrilus* with the Moniligastridae shows a number of similarities, but nearly all these are shared with other families or even larger groups: lumbricine setae (Eudrilidae, Lumbricidae, Ocnerodrilidae, Alluroidi-

[3] The terms Microdrili and Megadrili are used in this article in a loose sense, merely to refer collectively to the families Acolosomatidiae to Haplotaxidae or Alluroididae and Moniligastridae to Lumbricidae respectively. (*Vide* Stephenson, 1930, p. 721.)

[4] Not to be confused with a secondary type of posterior elongation in certain megascolecid species.

dae, Haplotaxidae), meganephric excretory system (Eudrilidae, Lumbricidae, Ocnerodrilidae, Glossoscolecidae, Microdrili), location of last hearts two segments in front of ovarian metamere (Ocnerodrilidae[5]), lateral hearts (Lumbricidae), location of male pores in front of female pores, elongate, posteriorly directed seminal vesicles and ovisacs, yolky ova and a one-cell-layered clitellum (Microdrili). Dissimilarities, on the contrary, are significant and as important as those which mark off Asiatic moniligastrids from other earthworms. In these circumstances common location of extraesophageal trunks lateral to the hearts and the presence of a relatively thick layer of nonfibrous material between circular and longitudinal muscles, can scarcely be regarded as evidence for any close relationships to Asiatic moniligastrids. Resemblances to *Desmogaster*, in location of spermathecal, male, and female pores, are superficial and of no significance.

What then are the affinities of *Syngenodrilus*? Yolky ova, a one-cell-layered clitellum, and posteriorly elongated seminal vesicles necessitate consideration of relationships with the Microdrili. Evidence from distribution and morphology (note especially segmental location of male and female pores and of spermathecae in viii and ix) point to the Alluroididae as deserving of most consideration. This family is monogeneric and hence recognition of family characteristics (apart from those merely of generic significance) is difficult. There is, however, no necessity for regarding absence of nephridia in a few anterior segments and presence of a gizzard as of sufficient importance to warrant exclusion of *Syngenodrilus*. Similarly proandry need not be regarded as of more than (if even of) generic value. After inclusion of *Syngenodrilus* the Alluroididae can still be defined as follows: Setae lumbricine. Male pores on or just behind 12/13, female pores on xiv, spermathecal pores on or close to 7/8 and (or) 8/9. Digestive system without appendages (or typhlosole?). Meganephric. Metagynous,[6] mature ova large and yolky, clitellum one-cell-layered. Spermathecae simple, without diverticula. A decision as to the necessity for retention of the subfamily Syngenodrilinae, of course, must be left to the future although some justification for recognition of two subfamilies at present appears to be provided by the male genital terminalia and possibly gizzards; Alluroidinae, male ducts opening to exterior through atria, no gizzards; Syngenodrilinae, male ducts opening to exterior independent of prostates, gizzards present. The author, because of lack of literature and material, is not in a position to determine whether similarities between *Syngenodrilus* and *Alluroides* are as unimportant as those between *Syngenodrilus* and *Desmogaster* and the suggestions advanced above must be left for consideration by those who are not so handicapped.

When further syngenodrilin material becomes available the histology of the "prostates" should be investigated. Superficially these structures resemble the tubular prostates of certain megascolecid genera. It should be noted that the "prostates" of *Syngenodrilus* are not united with the male deferent ducts as in *Plutellus* and other megascolecids, are not closely associated with the male deferent ducts as in certain diplotremids, acanthodrilids, and ocnerodrilids, nor do they open into seminal grooves as in other acanthodrilids and ocnerodrilids. Similarity appears to be rather with the "prostatelike" glands of *Sparganophilus* where the glands may be present in some species and not in others, with even some intraspecific variation as to presence and absence. Presence in *Syngenodrilus* of structures similar to the prostatelike glands of *Sparganophilus* need not then be an argument against inclusion of *Syngenodrilus* in the Alluroididae. More important seems to be the question as to whether absence of the alluroidid type of "atrial prostate" (apparently more like the capsular prostates of the Moniligastridae and the euprostates of the Eudrilidae) is sufficient reason for exclusion of the genus. This type of prostate has been regarded as an enlarged and modified ectal portion of the vas deferens.

[5] Other similarities to the Ocnerodrilidae, absence of typhlosole, dorsal pores (?) and spermathecal diverticula, an anterior intestinal origin in xii (?), and possibly tubular prostates.

[6] Stephenson, 1930, p. 806, locates the female pores on xiv but the ovaries in xii. Possibly the latter is a misprint for xiii, since length of oviducts, as a rule, is less than that of a single segment.

ZOOLOGY.—*Additional observations on the oligochaete genus* Syngenodrilus.[1]

GRACE E. PICKFORD, Osborn Zoological Laboratory and Bingham Oceanographic Laboratory, Yale University. (Communicated by WALDO L. SCHMITT.)

In the spring of 1945, in ignorance of the fact that Dr. G. E. Gates had included observations on the type of *Syngenodrilus* in an unpublished article entitled *On the Moniligastridae and phylogeny of the Oligochaeta*, the present author made an independent study of the specimen. Meanwhile, through correspondence with Dr. Gates, it was discovered that his article had been prepared for publication and that a carbon copy was available in the United States, although the original had been lost at the time of the Japanese invasion of Burma. After consultation with Dr. Waldo L. Schmitt, to whom my best thanks are due for his cooperation, and with the permission of Dr. Gates, it was decided to arrange for immediate publication of the first part of his article, that dealing with *Syngenodrilus*, in slightly condensed form together with some additional observations. The latter are presented herewith, in the form of a separate article, since there are certain discrepancies between the two accounts and the author did not feel that it would be right to introduce qualifications or corrections, based on his own opinion, into the text of Dr. Gates's account.

ADDITIONAL OBSERVATIONS

(1) *The sections.* The sections are mounted on 10 slides, labeled *a* to *j*, and except on four of these (*g* to *j*), where the gizzard region caused trouble, the series is reasonably complete and in good condition. The original description of Smith and Green, based largely on these sections, is remarkably accurate. Several of the original drawings are composite, but it is always possible to identify the actual sections from which they were made. No mistakes were discovered. On the other hand, as Gates has pointed out, no further light could be obtained regarding some of the points that were left unsettled in the original description; in particular, the relations of the septa in the region of the testis sacs must remain obscure until new material can be examined. The relationships of the genital pores to the setae can be reconstructed without difficulty, and there is no doubt that the original account is essentially correct. The male pore appears on slide *a*, on the sixteenth and seventeenth sections from the beginning; the spermathecal pores are on the second row on slide *b*; the prostates are on slide *d*; the female pore is on slide *e*.

The gizzard has a cuticular lining which ceases in the dilated, thin-walled, croplike region which follows. The position of the first intestinal segment cannot be determined.

(2) *The specimen.* Dorsal pores could not be seen either on the specimen or on the sections. The clitellum does not include the anterior third of segment xi but extends from 2/3 xi to xvi inclusive and is ring-shaped, as stated by Smith and Green. The male pore is clearly visible with good illumination and is situated in intersegmental furrow 12/13, about 3/5 *bc* lateral to setal line *b*; this observation conflicts with that of Gates but is in accordance with the evidence of the sections. The female pore is less conspicuous but can be seen lateral to seta *b* of segment xiv; this statement is not in agreement with that of Gates who found the female pores in front of seta *a*; on the sections, the oviduct is seen to open lateral to the *b* seta. The prostatic pores cannot be identified with certainty on the specimen, although clearly visible on the sections. Gates has described the position of the spermathecal pores, also very difficult to see, and their location is in agreement with that expected from a study of the sections.

A rectangular area resembling a copulatory band, which was not observed by Smith and Green or by Gates, occupies a region of the clitellum that is bounded above and below by setal lines *cd* and *ab*, respectively; this area is delimited anteriorly by intersegmental furrow 11/12 and posteriorly by the *ab* setae of segment xiv. The setae of the clitellar segments, difficult to see on the specimen, can readily be identified on the sections.

[1] Received October 24, 1945. See note to Dr. Gates's companion paper herein, p. 393.

Several attempts were made to obtain a sigmoid seta for examination, but unfortunately all that were removed proved to be broken at the distal extremity, no doubt as the result of much handling of the specimen. On the sections the ventral setae of segments xiv, xv, and xvi are preserved unbroken and in a favorable position for study; however, examination, even with an oil immersion apochromat, failed to reveal any definite evidence of ornamentation, although some faint surface markings of an obscure nature were observed. The refractive index of damar is unsuitable for the study of delicate setal ornamentation and the matter cannot be considered settled.

Confirming statements of Gates, the gizzards, shown in Smith and Green's fig. 2, have dropped out of the specimen and could not be found; there is no trace of calciferous glands either on the specimen or on the sections, and the intestine is without typhlosole. *Syngenodrilus* is holonephric; nephridia from segments xlii and xliii were removed and mounted, the terminal duct has a pear-shaped dilation at its ectal end.

DISCUSSION

Gates's observations are, with minor exceptions, in close agreement with those of the present author, and there is no doubt that the general pattern of his conclusions must be supported. Two points may be added to his discussion of the problem: On the one hand, the nephridia are quite unlike those of the moniligastrid genus *Drawida*, in which there is a remarkable blind sac extending dorsally from the ectal duct. On the other hand, the suspicions raised in his footnote 6 regarding the position of the ovaries in *Alluroides* are fully justified. In the original description of *A. pordagei* Beddard[3] stated that the ovaries were in segment xiii but later in the same article, in the formal diagnosis of the new genus, the ovaries are said to be in segment xii. Evidently subsequent diagnoses by Michaelsen[3,4] and Stephenson[5] have perpetrated this error, which stemmed from a misprint in the original article, although Beddard[6] himself corrected the generic description. Stephenson attempted an interpretation of the *Syngenodrilus* testis sacs as condensed segments and obtained, by a process of theoretical expansion, the following arrangement of the gonads: testes in x and xii, ovaries in xiv. Gates has pointed out that this interpretation is very improbable and reexamination of the material gives no support to such a theory.

Syngenodrilus can not be included in the Moniligastridae, and it is clear that it has strong affinities with the Alluroididae. Gates has suggested that it might even be placed within the latter family, but there are important differences that would appear to necessitate the recognition of two distinct subfamilies, Alluroidinae and Syngenodrilinae. In view of the inadequacy of our present knowledge of the Alluroididae,[7] a family whose characters will probably be clarified by the discovery of new species and genera, it seems preferable to retain the family Syngenodrilidae, while recognizing that future discoveries may bridge the gap that appears to exist at the present time. Michaelsen[4] proposed that the families Phreoryctidae, Alluroididae, Syngenodrilidae, and Moniligastridae should be placed together in the family-group Phreoryctina. It seems to the writer that there is much to be said in favor of such an arrangement; however, the Alluroididae and Syngenodrilidae differ from Haplotaxidae (= Phreoryctidae) on the one hand, and from Moniligastridae on the other hand, in a number of important respects, of which the most significant is the backward migration of the male duct which opens to the exterior at 12/13 or on segment xiii. As Gates has pointed out, the Syngenodrilidae differ from the Alluroididae in the possession of a well-developed, double, esophageal gizzard, in having simple *Sparganophilus*-like prostatic glands which are not related to the male opening, and in the absence of a moniligastrid-like atrium at the ectal end of the vas deferens.

[2] F. BEDDARD, Quart. Journ. Micr. Sci. 36: 244–252. 1894.

[3] W. MICHAELSEN, *Das Tierreich, Oligochaeta.* 1900.

[4] W. MICHAELSEN, *Oligochaeta, in* Kükenthal and Krumbach's "Handbuch der Zoologie." 1928.

[5] J. STEPHENSON, *The Oligochaeta.* Oxford, 1930.

[6] F. BEDDARD, *A monograph of the order Oligochaeta.* Oxford, 1895.

[7] The Alluroididae have hitherto been considered to be a purely African family, but the existence of an undescribed species in the Argentine was noted by L. Cernosvitov (Mem. Soc. Zool. Tchecoslovaque Prague 3, 1936). Dr. Cernosvitov informs me, *in litt.*, that this form is very close to the already known species but has enormous penial setae.

A formal redefinition of the family follows; of necessity it includes some characters which may, with the discovery of new forms, prove to be of less than family significance.

Family SYNGENODRILIDAE Michaelsen (1928)

Sigmoid setae single-pointed, eight per segment, in two ventral and two lateral bundles. Dorsal pores wanting. Clitellum in a single layer of cells, in the region of the male and female pores. One pair of male pores at 12/13; one pair of female pores on xiv; two pairs of spermathecal pores in 7/8 and 8/9. Two esophageal gizzards in viii and ix; no calciferous glands; intestine without typhlosole. Six pairs of lateral hearts in vi to xi (?), those of vi and vii communicating with lateral "extra-esophageal" vessels. One pair of holonephridia per segment; ectal nephridial duct with a dilated vesicle. Holandric, two pairs of testes and spermiducal funnels in x and xi, respectively, enclosed in testis sacs; paired seminal vesicles depending backward from 10/11, enclosed within the ovisacs. One pair of ovaries in xiii; ovisacs depending backwards from 13/14 into xx; eggs yolky. Three pairs of simple prostatic glands opening on xi, xii, and xiii just lateral to the *b* setae, not associated with the male pores. Penial and genital setae lacking. Spermathecae without diverticula. One genus: *Syngenodrilus;* monotypic, *S. lamuensis* Smith and Green.

ICHTHYOLOGY.—*Notes on fishes in the Zoological Museum of Stanford University: XX, New fishes from China and India, a new genus, and a new Indian record.*[1] ALBERT W. C. T. HERRE, Stanford University. (Communicated by HERBERT FRIEDMANN.)

This paper terminates a series begun in 1934. The first paper was a brief account of the fishes of my 1931 Philippine expedition and was published by me in Hong Kong. The series continued with accounts of new or rare fishes collected by me in various parts of the world and was published in various journals in this country.

South China abounds with a great variety of fishes, both marine and fresh water, which even yet are imperfectly known. This is particularly true of the region from Hong Kong southward, which has never been explored by an ichthyologist. Ten days were spent in Hong Kong during March 1941, and many rare cold-blooded vertebrates were secured. Two trips were made to the New Territory to study the fish-pond industry and to do a little collecting. A new species of *Vaimosa* was obtained and is here presented. This genus is rich in species in the regions bordering on the South China Sea, including the adjacent islands.

The coastal waters of India have never been adequately explored for littoral fishes; this is true alike for the coral reefs of the extreme south and the long reaches of the Coromandel and Malabar coasts. Investigation of the coastal waters, including brackish lagoons and the river mouths, should give us a greatly extended knowledge of fish distribution, as well as add many fishes to the known Indian fauna, some new species, and others known only from more or less remote regions. In this paper is recorded a fish hitherto known only from a single Philippine example, but really common in the Bay of Bengal. In addition, two gobies, an eleotrid, and a scorpaenid are presented as new. I have no doubt that collecting in the Andaman Islands would add 200 species to the known Indian fish fauna.

The labors of the competent staff of the Indian Zoological Survey, particularly of Dr. S. L. Hora, have added greatly to our knowledge of the fresh-water fishes of India, and as a result those of northern and central India are fairly well known. Much less has been done on the fishes of the streams of south India, and it is to be expected that new fishes should be found in that region, particularly in the hill streams. I have already described a new catfish from the Anamallai Hills, and now present a member of the genus *Homaloptera* from the same locality. Dr. Hora has already described two homalopterid fishes from Travancore and Mysore. One of them, *Bhavania australis*, was described by Jerdon

[1] Received July 2, 1945.

in 1848 under the name of *Platycara australis*. Because of its peculiarities Dr. Hora created the genus *Bhavania* for it and extended our knowledge of the fish. The other homalopterid, *Travancoria jonesi*, was first described by Dr. Hora.

The Puthutotam Estate in the Anamallai Hills, where I collected the new *Homaloptera*, is not far from the region in Travancore where both *Bhavania australis* and *Travancoria jonesi* occur, although separated by forest-clad mountains. That the fauna of the two areas is much the same is shown by the fishes common to their streams; one of them, *Travancoria jonesi*, which I also collected at the Puthutotam Estate, is of special interest as showing that it is not confined to the streams at the foot of the Travancore mountains.

The members of the genus *Homaloptera* occur in the East Indies, Malaya, and Burma, and apparently this is the first time that a member of the genus has been found in South India. The earlier accounts of *Homaloptera* from south India all refer to *Bhavania australis*. Burma is the nearest region to south India from which *Homaloptera* has been known hitherto. It is therefore a matter of much interest to students of geographical distribution to find a species of *Homaloptera* in the mountain streams of south India. It has been known for a good while that many of the fishes of south Indian streams have their closest relatives in, or are identical with, species in the streams of Malaya. Dr. Hora has paid much attention to the problems involved, and I agree with his theory that the homalopterid fishes and other torrential dwellers reached south India by migrating along the Satpura Trend.

Lengths given are always the standard length.

Family HOMALOPTERIDAE

Genus **Homaloptera** Van Hasselt

Homaloptera montana, n. sp.

Dorsal II–6; anal I–5; pectoral VI–8; ventral, II–7 on one side, III–6 on the other side; lateral line about 72; transverse series of scales 16–1–12.

The depth is 9.6, the head 4.8, the pectoral 3.8 times in the length; the caudal and ventral equal the head. The eye is 4.3, the snout 2, the postorbital length of the head 2.5 times in the head; the flat interorbital is a little more than the eye; the least depth of the caudal peduncle is twice in its own length.

The form is slender, the posterior half laterally compressed, the dorsal profile little elevated, the eyes dorsolateral; the snout descends steeply, with rather flat tip; the arched mouth is small, the barbels small and inconspicuous. The dorsal origin is well behind the ventral origin and behind the middle of the length, the distance from the tip of the snout to the dorsal being 52 percent, to the ventral origin 43 percent, of the total length; stated differently, the ventral origin is opposite the nineteenth tubule of the lateral line, the dorsal origin opposite the twenty-sixth. The tip of the pectoral touches the ventral origin when depressed, but the ventral falls short of the anus, which is noticeably in advance of the anal origin. The caudal is nearly truncate, the corners little projecting. The head and entire lower surface back to a little behind the ventral base are naked.

The color in alcohol is brown, the underside yellowish; 10 short dark brown bars across the back, but not extending down to the lateral line; a poorly defined dark longitudinal stripe below the lateral line from the eye to the caudal base; top of the head very dark brown; a blackish-brown spot on the ventral base; caudal with a blackish blotch on its base and another near its tip; other fins all clear.

Described from the type and only specimen, 48 mm long, which I took from a brook on the Puthutotam Estate in the Anamallai Hills at about 3,600 feet altitude, Valaparai Postoffice, Madras Presidency, South India.

Family SCORPAENIDAE

Genus **Scorpaena** Linnaeus

Scorpaena lacto-maculata, n. sp.

Dorsal XI–I–9; anal III–5; about 60 scales in a longitudinal row above the lateral line; 25 tubulated scales in lateral line; about 38 scales in transverse series, 8 from the sixth dorsal spine to the lateral line.

Depth 5.5, caudal 6.9, head 4.18, pectoral 5.8, ventral 7.4 times in the length. The eye is 5.5 times in the head and is a little more than the interorbital breadth; snout 3.4 times in

head. The longest dorsal spine is approximately a third of the head; the longest dorsal rays equal the second anal spine, 2.6 times in the head; the third anal spine is as long as the second but is much slenderer; longest anal ray is half as long as the head. The 6 upper pectoral rays are divided, the 12 lower ones simple.

Interorbital deeply concave, the prominent supraorbital ridge with 3 spines, followed by a large spine behind the ridge; a spine on each side of the prominent hump on the snout; 2 spines, very close together, on each side of the nuchal area; behind the middle of the eye is a group of small spines, followed by a row of 3 rather widely spaced spines; 2 opercular spines; 4 spines on the bony stay below the eye and a row of spines on the hind margin of the preopercle; a spine on the shoulder girdle above the pectoral base. Head scaleless or with a very few small scales on the opercular flap; many tentacles, often large and fringed, on the head, between or on spines, on the broad maxilla and overhanging it, on the chin and along the rami of the lower jaw, on the cheeks, and 2 or 3 small ones on the upper part of the eye ball; simple flaps along the lateral line and on numerous scales on the sides of the body. The large mouth is oblique, the maxilla extending beyond the hind margin of the eye; no palatine teeth.

The color in alcohol is freckled reddish brown, with 2 or 3 bands of darker brown extending across fins and body; just above the lateral line and beneath the ninth dorsal spine is a circular milky spot, larger than the pupil; beneath the eye is a similar but much smaller spot; at the hind end of the soft dorsal base is a larger milky spot, partly on the fin but mostly on the body; the numerous tentacles or flaps below the lateral line are also milky white; these spots and tentacles were probably opalescent in life. The pectorals, dorsal, and caudal have broad pale or white, but not milky-white, cross bands.

Described from two specimens taken from "shallow water near Bombay," India, each of them 222 mm in length. The type is in the Indian Museum, the paratype in the Natural History Museum of Stanford University.

Genus **Brachypterois** Fowler

Brachypterois serrulifer Fowler

Brachypterois serrulifer Fowler, Proc. U. S. Nat. Mus. 85: 79, fig. 35. 1938.

This fine scorpaenid was described from a single specimen, dredged 8.4 miles off San Fernando Point, on the west coast of Luzon, Philippine Islands. To Fowler's description I can add that the pectorals are black and that the ventral rays are also black except basally.

This species must be rather common in the northern end of the Bay of Bengal. One specimen, 73 mm long, was taken by the Bengal Fisheries Department on the Arakan coast. Another of 65 mm was caught off Gopalpur, Orissa. Fifteen examples from 43 to 80 mm in length were dredged at the mouth of the Hugli River by the *Lady Fraser*.

Dorsal XII–I–10; anal III–5; pectoral 16.

Family ELEOTRIDAE

Genus **Hypseleotris** Gill

Hypseleotris raji, n. sp.

Dorsal VI–I–8; anal I–7; scales ctenoid, 28 in lateral series plus 2 on caudal base, 9 in transverse series; 12 predorsal scales.

The body is moderately plump and stout, the dorsal profile well arched, descending steeply from the dorsal origin to the tip of the snout; the depth and caudal are equal, $4\frac{1}{3}$, the head 3 times in the length; the large eye is in the anterior half of the head, dorsolateral, scarcely larger than the broad snout, 4 times in the head; the interorbital is 1.35 times in the eye; the postorbital is slightly more than half the head. The fins are all low, the longest dorsal spine 3.14 times in the head or 9.4 in the length; the last ray of the second dorsal is longest, 2.44 in the head or 7.33 times in the length; the ultimate and penultimate anal rays are longest, 2.2 in the head or 6.6 in the length; the pectoral extends above the anal, 3.66 in the length; the ventrals reach the anal, four and an eighth in the length. All scales are ctenoid, those on the cheeks very small; anal papilla thin, slender, blunt, inconspicuous.

The ground color in alcohol is pale tan, with 4 double cross bands of dark brown, the first over the nape, the last on the caudal peduncle; the ground color appears as pale bands and rows of spots through the cross bands; a blackish-brown cross bar on the caudal base; dark brown bands from the eye on the snout and across the cheek, at least two of them continuing on the under side of the head to meet similar bands from the other eye. The first dorsal is largely black; the second dorsal has a blackish

band basally, then a clear band, the outer third or half blackish; the anal and ventrals have black rays with dark or blackish membranes; the pectoral base has a large dark brown spot, the fin clear; the caudal has 4 circular black spots on its base.

The type and only specimen is a male 33 mm long, taken from the Adyar River, Madras. Named for Dr. B. Sundara Raj, former director of fisheries for the Madras Presidency, who did so much to make my visit to Madras successful.

Family GOBIIDAE

Orissagobius, n. gen.

Dorsal VI–I–8 or 9; anal I–8 or 9; scales large, finely ctenoid, 22 to 24 in longitudinal, 6 in transverse series; a narrow naked predorsal strip, the nape otherwise covered with cycloid scales almost to the eyes; preopercle covered with large deciduous cycloid scales; opercle naked except for one or two cycloid scales at the upper inner corner. Eye large, in anterior half of head, interorbital very narrow; snout short, two-thirds or less of eye; mouth strongly oblique, each jaw with an outer row of stout, enlarged, sharp-pointed and curved teeth, followed by 3 rows of minute teeth, at least the outer rows of teeth visible when the mouth is closed; tongue large, fleshy, truncate or slightly notched; gill opening extending forward to beneath the hind margin of the preoperculum. Fins all elongate, the upper rays of the caudal greatly extended, some specimens with the caudal half the standard length; the antepenultimate ray of the second dorsal longest, equal to or longer than the head, the same ray in the anal nearly as long; pectoral about four-fifths of the head, its base long and fleshy; no free pectoral rays; ventrals large, with a well developed frenum, free from abdomen. Tissues of this fish fragile, showing that it lives in rather deep water.

Type of genus: *Orissagobius cometes* (Alcock). Known only from the Ganjam coast, Orissa, India. Dredged from depths of a little more or less than 100 fathoms, by the S.S. *Investigator*, of the Indian Marine Survey. Eight specimens, 61 to 73 mm in length, were examined.

Genus **Macgregorella** Seale

Macgregorella indica, n. sp.

Dorsal VI–I–9; anal I–8; predorsal scales 4; about 50 longitudinal scales, 14 in transverse series; the head is entirely naked.

The depth equals the rounded caudal, 6 times in the length; the large broad flat head is 3.47 in the length, its depth 1.6 times in its breadth, which is 1.28 in its own length; the broad blunt snout is 3.95 times in the head; the small eyes are dorsolateral and in the anterior half of the head, 7.3 in the head and 1.38 times in the broad interorbital; the teeth are typical of the genus.

The snout, sides, and underparts of the head are marked by numerous rows of sensory papillae, some of them elongated and somewhat resembling barbels, especially on the chin and underside of the head. A large pore before the inner margin of each eye, and a transverse row of 4 large pores behind the eyes and interorbital space. The dorsals are low, the height of the first 4.75 in the head; the posterior rays of the second dorsal and anal are longest, 8.25 times in the length or 2.375 in the head; the broad pectoral is eight-ninths of the head, 3.88 in the length; the ventrals are typical goby ventrals with a strong and well developed frenum, and are contained a trifle over 5 times in the length or 1.46 in the head.

The color in alcohol is pale reddish brown with 4 broad conspicuous dark reddish-brown cross bands on the trunk and a narrow stripe of the same color on the caudal base; the first band extends upon the pectoral on both its inner and outer faces; between the cross bands are blotches and streaks of reddish brown; the second cross band extends upon the first dorsal, the third and fourth upon the second dorsal; the anal and caudal are obscurely barred by brown.

Described from the type and only specimen, 33 mm long, taken from coral at Krusadai Island in the Gulf of Manaar, Pamban District, Madras Presidency, South India. Such specimens as this show the fallacy of placing all gobies with ridges of papillae on the head, and the body barred with brown, in the genus *Callogobius*, which is marked by weak ventrals with a very slight fragile frenum. In spite of Kouman's assertion, *Macgregorella* is a good genus.

Genus **Vaimosa** Jordan and Seale

Vaimosa adyari, n. sp.

Dorsal VI–I–7; anal I–7; scales in lateral se-

ries 26, plus 3 on the caudal base, in transverse series 8; predorsal scales 7, the anterior one much enlarged and projecting forward between posterior part of the eyes; opercular scales 6.

The compact body is little compressed, the dorsal profile almost horizontal, the ventral profile slightly curved; the depth is 5 to 5.25, the head 3.8, the caudal 2.8, the pectoral 3.33 to 3.8, the ventral 4.2 times in the length. The snout is broad, blunt, convex, 5.2 to 5.5 times in the head; the eye is moderately large, lateral, in the anterior half of the head, in which it goes 3.4 times; the postorbital is slightly longer than the eye and snout together; the narrow interorbital is not more than a fourth of the eye; the oblique mouth is subterminal, the lower jaw weak, the maxillary extending beneath the anterior margin of the eye, or a little beyond; the vertical fins are small, the dorsals rather far apart, the second and third spines of the first dorsal longest, 2.1 or 2.2 in the head, 8 times or a little more in the length; the second dorsal and anal are of equal height, both falling far short of the caudal base when depressed, six and two-thirds or 7 times in the length; the pectoral equals or slightly exceeds the head, 3.5 to 3.8 in the length; the ventrals are broadly pointed, with strong well developed frenum, 1.1 in the head; the least depth of the caudal peduncle is about 1.7 times in its own length; the small inconspicuous anal papilla is slender and pointed in males.

The color in alcohol is very pale yellowish, with 5 short brown dorsal cross bands, the first predorsal, the second under the first dorsal, the next two under the second dorsal, and the fifth on the caudal peduncle; along the middle of the side are 5 oblong brown spots, the last on the caudal base, with another spot below it; on the sides are also scattered flecks of brown; a spot on the pectoral base, one on the opercle, and one below the eye; the posterior half of the first dorsal is black; the second dorsal has 3 cross rows of black or brown spots, the caudal 5 irregular cross rows of brown spots; some of the rays of the anal and ventrals are dotted with black and there are 3 to 5 black spots on the median line of the body between the anal origin and the caudal base.

Described from 2 male specimens, the type 21 mm long and paratype 20 mm, and a juvenile specimen 15.5 mm in length. They were taken by me on January 4, 1941, from the Adyar River, opposite "The Anchorage," the residence of Dr. B. Sundara Raj, former director of fisheries of the Madras Presidency. This is not far from the Bay of Bengal, and the Adyar River is more or less brackish at this point.

Vaimosa crassa, n. sp.

Dorsal VI–I–7; anal I–8; scales in longitudinal series 36, plus 3 or more on the caudal base, 12 in transverse series; predorsal scales 15, extending through the interorbital space to the front margin of the eyes; preopercular scales 9 or 10.

Body thick, plump, only the posterior third being laterally compressed; dorsal outline very slightly arched, nearly horizontal; ventral profile gently arched; the head is contained 3.7 to 3.8, the depth 4.55 to 4.7, the short rounded caudal 4.85 to 5.14 times in the length; the large eye equals or exceeds slightly the length of the snout, 3.8 times in the head; the postorbital is a trifle less than the eye and snout together; the broad interorbital equals or slightly exceeds the eye; the wide mouth is inferior, the maxillary extending beneath the front third of the eye, or almost to its middle; in males the maxillary probably extends beyond the eye. The fins are all small, the vertical fins low, the second spine of the first dorsal 2.2 to 2.6 in the head or 8.3 to 9.5 times in the length, the dorsals far apart; the height of the second dorsal is approximately 2 to 2.4 times in the head or 7.5 to 8.9 in the length; the longest anal ray is 2.3 to 2.4 in the head or 8.9 to 9 times in the length; the anal and second dorsal fall far short of the caudal base when depressed; the short rounded pectoral is 1.3 to 1.4 in the head or 4.85 to 5.5 times in the length; the ventral extends but half way to the anal papilla, 1.85 or 1.9 in the head and 6.8 to 7.2 in the length; the least depth of the caudal peduncle is 1.4 times in its own length. Females have a short, broad, bluntly rounded, and inconspicuous anal papilla.

Alcoholic specimens are marked by broad dark brown diagonal bands inclined forward and downward, with narrow and very pale tan stripes between; one specimen has the head and body before the first dorsal all brown, mottled with dusky. On the middle of the front margin of the opercle is a blackish spot, with a dark stripe descending from it to the underside of the head; a black spot near the upper end of the

caudal base; the first dorsal is blackish, the second dorsal and anal more or less dusky; the other fins are colorless.

Here described from two female specimens, the type 34 mm long. and paratype 36 mm long They were taken from a brook near Un Long, New Territory, Hong Kong. No other specimens were secured.

APPEAL TO AMERICAN SCIENTISTS

Many scientists and their families are enduring severe hardships in occupied countries. We, the undersigned, wives of American scientists, want to help these innocent victims of the Axis. We suggest the desirability of supplementing the work of the established relief agencies by sending gift packages of clothing and food directly to individual scientists and their families. Some of us have already sent packages to friends whose present addresses are known, and the acknowledgments we have received leave no doubt of the urgent need which these packages are helping to meet. Used clothing and shoes are genuinely appreciated.

American scientists who would like to send packages to colleagues in the occupied countries may obtain names and present addresses from the Secretary of this group. It is suggested that you indicate the country of your greatest interest and the ages of the children for which you can supply clothing.

A package sent *now* is worth six sent next spring.

LANGHORNE H. BRICKWEDDE
LOUISE MCD. BROWNE
EMILIE H. CONDON
LOLA S. DEMING
EDITH O. HENDRICKS
MILDRED R. MASI
GRACE H. RUARK
GRACE H. SMITH, *Secretary*
National Bureau of Standards,
Washington 25, D.C.

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